M. Sc. Information Technology

Syllabus

UNIVERSITY DEPARTMENT

Program Code: CSEF

2021 – 2022 onwards

BHARATHIAR UNIVERSITY

(A State University, Accredited with "A" Grade by NAAC,
Ranked 13th among Indian Universities by MHRD-NIRF,
World Ranking : Times - 801-1000, Shanghai - 901-1000, URAP – 1047)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives(PEOs)	
The M.Sc. Information Technology program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Be a Software Engineer or Developer either as an individual or as a team player in the Information Technology industry and allied branches providing viable solutions.
PEO2	Initiate life-long learning to acquire new technologies and adapt to the changing needs of Information Technology Industry through self-study, graduate work and professional development.
PEO3	Exhibit professional excellence, ethics, soft skills, leadership qualities as a responsible citizen with societal interest to match the standards of the Industry 4.0
PEO4	Graduate will be able to pursue higher studies in the field of Information Technology.
PEO5	Provide simplest automated solution to various legacy systems.
PEO6	Analize, Design and Create innovative products for real time applications.
PEO7	Take up studies in the higher education institution in applied automated research.
PEO8	Acquire the skills needed to become an entrepreneur in the Information Technology areas.
PEO9	Able to get placed in Government / Public sectors to take care of Information Technology based solutions.
PEO10	Provide knowledge and skills to participate and be successful in choosing careers in the CIVIL services.

Program Specific Outcomes (PSOs) **After the successful Completion of M.Sc.(IT) Programme, the students are expected to**	
PSO1	Gain thorough knowledge about the theoretical fundamentals in the Information Technology field.
PSO2	Familiarity and practical exposure in a broad range of programming languages.
PSO3	Get gain expertise in the design and development of Open Source platform.
PSO4	Design, Develop and Test software systems for real world problems.
PSO5	Inculcate skills to excel in the field of Information Technology.
PSO6	Formalize and practice innovative ideas to suit the development as per the Industry 4.0 specifications.

Program Outcomes (POs)	
On Successful completion of the M.Sc.(Information Technology) programme, the students will be able to	
PO1	Apply the knowledge of Mathematics, Science and Computing in the core Information Technologies.
PO2	Create, Select, and Apply appropriate techniques, resources and modern Information Technology tools including prediction and modeling to complex activities with an understanding of the limitations.
PO3	Get Problem solving and programming ability to solve complex problems is the field of Information Technology.
PO4	Develop techniques for Capturing, Analysing and Storing the digital data in a structure format.
PO5	Design and Integrate different networks for fast and secure data transfer in the different network platforms.
PO6	Create need based customized tools and software for Industrial Automations.
PO7	Enrich the skill set to meet professional expectations in the Multimedia, Image processing, Augmented Reality, Virtual Reality and Animation Industries.
PO8	Develop and Implement solutions to real time problems using latest algorithms and techniques.
PO9	Provide Web based solutions in the field of Commerce and Industry 4.0.
PO10	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

BHARATHIAR UNIVERSITY : : COIMBATORE 641 046

M. Sc. (Information Technology) Curriculum (University Department)

(For the students admitted during the academic year 2021 – 22 onwards)

Suggested Code	Title of Course	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
First Semester							
21IT13A	Advanced Java Programming	4	50	-	50	50	100
21IT13B	Design and Analysis of Algorithms	4	50	-	50	50	100
21IT13C	Relational Database Management System	4	50	-	50	50	100
21IT13D	Web Programming	4	50	-	50	50	100
21IT13P	Advanced Java Programming - Lab	3	-	38	30	45	75
21IT13Q	Relational Database Management System-Lab	3	-	38	30	45	75
21IT1EX	Elective – I	4	50	-	50	50	100
21IT1GSXX	Supportive	2	26		25	25	50
Total		28	276	76	335	365	700
Second Semester							
21IT23A	C# and .NET Programming	4	50	-	50	50	100
21IT23B	Graphics and Multimedia Systems	4	50	-	50	50	100
21IT23C	Information and Data Security	4	50	-	50	50	100
21IT23D	Python Programming	4	50	-	50	50	100
21IT23P	C# and .NET Programming - Lab	3	-	38	30	45	75
21IT23Q	Python Programming Lab	3	-	38	30	45	75
21IT2EX	Elective – II	4	50	-	50	50	100
21IT2GSXX	Supportive	2	26	-	25	25	50
Total		28	276	76	335	365	700

Third Semester							
21IT33A	Embedded Systems	4	50	-	50	50	100
21IT33B	Software Testing	4	50	-	50	50	100
21IT33C	Cloud Computing	4	50	-	50	50	100
21IT33D	Mobile Application Development	4	50	-	50	50	100
21IT33P	Software Testing - Lab	3	-	38	30	45	75
21IT33Q	Mobile Application Development - Lab	3	-	38	30	45	75
21IT3EX	Elective – III	4	50	-	50	50	100
21IT3GSXX	Supportive	2	26	-	25	25	50
Total		28	276	76	335	365	700
Fourth Semester							
21ITPRO	Project work and Viva-Voce	6	-	-	60	90	150
Total		6			60	90	150
Grand Total		84	828	228	1065	1185	2250

M.Sc.(Information Technology) - (University Department) 2021-22
ELECTIVE PAPERS

Suggested Code	Title of Course	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
21ITE01	Digital Image Processing	4	50	-	50	50	100
21ITE02	E- Commerce	4	50	-	50	50	100
21ITE03	Mobile Ad-Hoc Networks	4	50	-	50	50	100
21ITE04	Internet of Things	4	32	60	50	50	100
21ITE05	Cyber Security	4	50	-	50	50	100
21ITE06	Robotics and Automation	4	50	-	50	50	100
21ITE07	Object Oriented Software Engineering	4	50	-	50	50	100
21ITE08	Open Source Technology	4	32	60	50	50	100

M.Sc. (Information Technology) - (University Department) 2021-2022

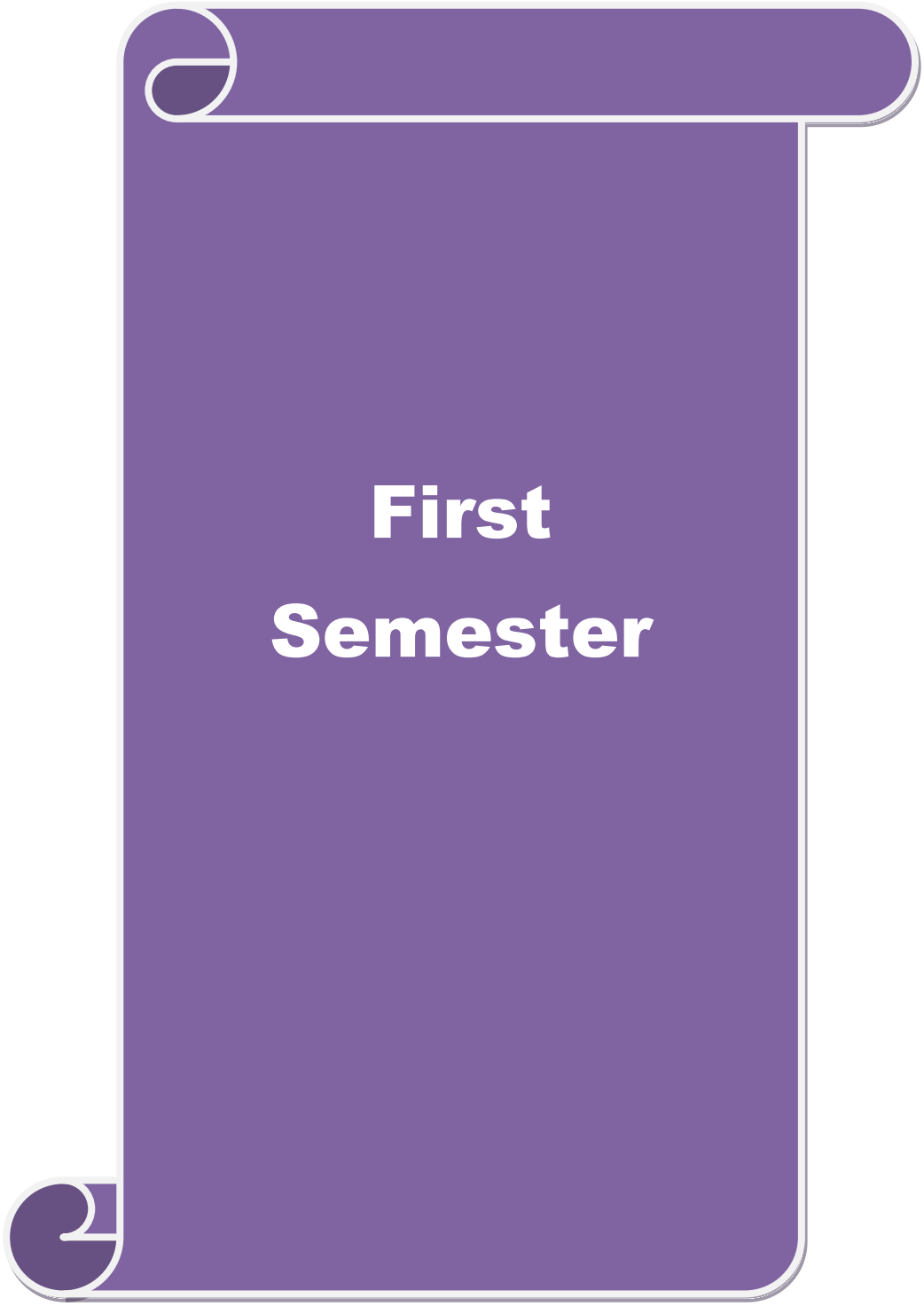
LIST OF SUPPORTIVE COURSES

Suggested Code	Title of course	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
21ITS01	Introduction to Industry 4.0	2	26	-	25	25	50
21ITS02	Windows and Office Automation	2	26	-	25	25	50
21ITS03	Basics of Internet	2	26	-	25	25	50
21ITS04	Introduction to Information Technology	2	26	-	25	25	50

M.Sc. Information Technology (University Department) 2020-2021

LIST OF JOB ORIENTED COURSES/ VALUE ADDED COURSES

	Title of course
1	Certificate course in Embedded systems and Wireless Sensor Networks for IOT
2	Certificate course in Multimedia and Animation
3	Certificate course in Linux Administration


First
Semester

Course code	21IT13A	ADVANCED JAVA PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	3	1		4
Pre-requisite		UG-Degree level: Basic Java, OOPs Concepts, Applets	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. To establish a connectivity between Java database using JDBC/ODBC connection.
2. To understand the concept of Applets and the delegation event model.
3. To introduce servlet packages along with JavaScript and study about Java Server Pages and Entity Java Beans.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Describes about the basic object oriented concepts like encapsulation, polymorphism and various AWT concepts	**K2/K3**
2	Explains about networking in advanced java using client/server communication and remote method invocation. Provides an overview about HTML tags and explain about java applets and event.	**K2/K3/K4**
3	Handles different event in java using the delegation event model, event listener and class.	**K2/K3**
4	Evaluate the business logic of enterprise applications.	**K2/K5**
5	Explain how to simplify of large distributed applications.	**K2/K3**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Basic Concept	9 hours

Features, Characters of JAVA-**Object-Oriented Programming:** Encapsulation, Inheritance, Polymorphism, Method Overriding, Method Overloading, Swing - Swing and AWT components- **Database programming with JDBC:** JDBC/ODBC Bridge, Establishing a connection, Java.sql packages, JDBC data sources, Connection pooling.

Unit:2	Distributed Applications and Networking	9 hours

Client/Server communication - RMI, Advantages of RMI, RMI Architecture, RMI Applications - JVM, Java Serialization, Java Networking, classes and interfaces, **Networking:** Inet Address, TCP/IP Client Sockets, URL Connection, Http URL Connection, URL Class, Cookies, TCP/IP Server Sockets, Datagrams.

Unit:3	Applets and Events	10 hours

Applets, HTML applet tags, Order of Applet initialization, Sizing graphics, Applet architecture, applet skeleton, passing parameters to applets. **Events:** Mouse Event Handling, the Delegation Event Model, Event class and event listener, Event Listener Interfaces, using the delegation event model.

Unit:4	**JDBC and Servlets**	**10 hours**
JDBC vs. ODBC, Types of JDBC Drivers, Basics JDBC - Features of Servlets, Servlet lifecycle service, Simple servlet program - Database Connectivity with JDBC using Servlet, servlet development options, **JavaScript**: JavaScript, dynamic page, operators, decision making, relational operators, cookies, sessions, URL rewriting, data storage.		
Unit:5	**JSP and EJB**	**10 hours**
Define JSP, Advantages of JSP, JSP tags, Servlet vs. JSP, JSP Syntax Basics, JSP Directories - EJB Benefits, Types of Enterprises Beans, Session Bean with types, Entity Bean, Entity Beans vs. Session Beans, Message Driven Beans, remote client, web server clients, contents of an enterprise bean, life cycle of EJB.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
Latest Development/ Topics in Advanced Java Programming.		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	Java - The Complete Reference, Herbert Schildt, Tata McGraw-Hill, ninth edition, 2014.
2	Advanced Java for Students, Dr.AshwinMetha and Sarika Shah, The X team, published by SPD Pvt. Ltd, 2012.
Reference Books	
1	Professional Java Server Programming, Subrahmanyan Allamaraju and Cedric Bues, Apress, SPD, 2005.
2	Java 2: Programmer's Reference, Herbert Schildt, Joseph O'Neil, 2000.
3	Jamie Jaworski, “Java Unleashed”, SAMS Techmedia Publications 1999.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/106/105/106105191/, https://www.digimat.in/nptel/courses/video/106105191/L01.html, https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs08/, https://www.youtube.com/watch?vkpSUw_FTg4,https://www.youtube.com/watch?vVksxhzfD8kQ, https://swayam.gov.in/nd1_noc19_cs84/preview
2	https://www.classcentral.com/course/swayam-programming-in-java-12930
Course Designed By: **Dr.R.VADIVEL.**	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	S	L	S	S	M
CO3	M	S	S	M	M	M	L	L	M	L
CO3	S	S	M	L	S	S	L	S	S	M
CO4	M	M	S	M	S	M	L	M	S	S
CO5	S	S	M	M	L	M	L	S	M	L

*S-Strong; M-Medium; L-Low

Course code	21IT13B	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		Data Structures at UG level	Syllabus Version	2021-22		

Course Objectives:

The Main Objectives of this Course are to:

1. This Course Will Enable Students to Solve a given Problem Using an Algorithm.
2. Also, It Enables to Mathematically Analyse the Algorithms for its Efficiency and Effectiveness.
3. It also improves the Knowledge of the Students to Do Research in Further Developments.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Summarize the relevance of algorithms for computational Problems solving and real time applications.	K2
2	Differentiate different algorithmic approaches, techniques and methods	K4
3	Apply design and analysis techniques for a given algorithm.	K3
4	Apply optimization techniques for improving the efficiency of algorithms.	K3
5	Calculate difficult steps with algorithms	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

UNIT:1	ALGORITHMS	9 HOURS

Algorithms - Insertion Sort - Analyzing Algorithms - Designing Algorithms - Asymptotic Notation - Standard Notations and Common Functions - The Maximum-Sub Array Problem – Strassen's Algorithm for Matrix Multiplication - The Substitution Method for Solving Recurrences - The Recursion-Tree Method for Solving Recurrences - The Master Method for Solving Recurrences.

UNIT:2	PROBABILISTIC ANALYSIS AND RANDOMIZED ALGORITHMS	9 HOURS

The Hiring Problem - Worst-Case Analysis - Probabilistic Analysis - Randomized Algorithms - Indicator Random Variables - Problems - Randomly Permuting Arrays - Probabilistic Analysis and Further Uses of Indicator Random Variables - The Birthday Paradox - An Analysis Using Indicator Random Variables - Balls and Bins - The On-Line Hiring Problem - Problems.

UNIT:3	SORTING ALGORITHMS	11 HOURS

Heap Sort – Heaps - Maintaining the Heap Property - Building a Heap – Initialization – Maintenance - Termination – The Heap Sort Algorithm – Priority Queues – Quicksort -

Description of Quicksort - Performance of Quicksort - A Randomized Version of Quicksort - Analysis of Quicksort - Sorting in Linear Time - Lower Bounds for Sorting - Counting Sort - Radix Sort - Bucket Sort.		
UNIT:4	**STACKS AND QUEUES**	**9 HOURS**
Elementary Data Structures - Stacks and Queues - Linked Lists - Sentinels - Implementing Pointers and Objects - Representing Rooted Trees - Binary Trees - Binary Search Trees - Binary Search Tree - Querying a Binary Search Tree - Insertion and Deletion - Randomly Built Binary Search Trees - Red-Black Trees - Properties of Red-Black Trees – Rotations – Insertion – Deletion.		
UNIT:5	**DYNAMIC PROGRAMMING**	**10 HOURS**
Matrix Chain Multiplication - Elements of Dynamic Programming - Longest Common Subsequence - Improving the Code - Optimal Binary Search Trees - Greedy Algorithms - An Activity Selection Problem - Huffman Codes - Improving the Code - Prefix Codes - Constructing a Huffman Code - Correctness of Huffman's Algorithm - Amortized Analysis - Aggregate Analysis.		
UNIT:6	**CONTEMPORARY ISSUES**	**2 HOURS**
Expert Lectures, Online Seminars – Webinars		
	TOTAL LECTURE HOURS	**50 HOURS**

Text Book(s)	
1	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, Third Edition, 2009.
Reference Books	
1	Data Structure and Algorithm Analysis in C, Weiss, Mark Allen, Addison Wesley, 2006.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	Design and Analysis of Algorithms by Prof. Abhiram Ranade, Dept of CSE, IIT Bombay.
Course Designed By: Dr. E. BOOPATHI KUMAR.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	M	L	S	S	S	S
CO3	S	S	S	S	S	S	S	S	M	L
CO3	S	S	M	S	S	S	S	S	S	S
CO4	L	M	L	L	S	M	S	S	S	S
CO5	M	L	M	S	L	S	S	S	L	M

*S-Strong; M-Medium; L-Low

Course code	21IT13D	RELATIONAL DATABASE MANAGEMENT SYSTEM	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		UG level – Database management system	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. This course aims at facilitating the student to understand the various functionalities of DBMS software.
2. It helps to perform many operations related to creating, manipulating and maintaining databases for Real-world applications
3. It helps the students to understand the various designing concepts, storage methods, querying and managing databases.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Explain the structure and model of the relational database System	K2
2	Design multiple tables, and using group functions, sub Queries	K3
3	Design a database based on a data model considering the normalization to a specified level	K4
4	Estimate the storage size of the database and design appropriate storage techniques	K3
5	Analyze the requirements of transaction processing, concurrency control	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction	8 hours

Database-System Applications - Purpose of Database Systems - View of Data - Database Languages - Relational Databases - Database Design - Data Storage and Querying - Transaction Management - Database Architecture - Data Mining and Information Retrieval - Specialty Databases - Database Users and Administrators - History of Database Systems - Exercises..

Unit:2	Transaction Management	11 hours

Overview of Transaction Management- The ACID properties – Transactions and Schedules – Concurrent execution of Transactions – Lock based concurrency control – Performance of locking - Transaction support in SQL – Introduction to crash recovery – The log – Other recovery related structures – Check pointing – Recovering from a system crash – Media Recovery.

Unit:3	Object based Databases and XML	10 hours

Structured Data Types - Operations on Structured Data - Encapsulation and ADTs – Inheritance - Objects, OIDs, and Reference Types - Database Design for ORDBMS - ORDBMS Challenges – OODBMS - Comparing RDBMS, OODBMS, ORDBMS – XML – Structure – XML Schema –

Querying and Transformation - The Application program interface – Storage of XML data- XML Application - Case Study in XML.		
Unit:4	**Parallel and Distributed Databases**	**10 hours**
Parallel Databases - I/O Parallelism – Inter query - Intra query Parallelism – Intra operation - Interoperation Parallelism - Query Optimization - Design - Parallelism on Multicore Processors - Distributed Databases - Homogeneous and Heterogeneous Databases - Data Storage - Transactions - Commit Protocols - Concurrency Control – Availability - Query Processing - Heterogeneous Databases - Cloud-Based Databases - Directory Systems.		
Unit:5	**NoSQL**	**9 hours**
NoSQL Basics - Definition and Introduction - Sorted Ordered Column-Oriented Stores - Key/Value Stores - Document Databases - Graph Databases - Interfacing and Interacting with NoSQL - Language Bindings for NoSQL Data Stores – Storage Architecture- HBase Distributed Storage Architecture - NoSQL in Cloud - Google App Engine Data Store - Amazon SimpleDB – Case Study in MongoDB.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
Latest developments/topics in RDBMS		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	Silberschatz, Korth, Sudarshan, “Database system concepts”, 6th Edition, Tata McGraw Hill (For UNITS I, IV), 2011.
2	Ramakrishnan, Gehrke, “Database Management Systems”, Tata McGraw Hill (For UNIT II, III), 2003.
3	Shashank Tiwari, “Professional NoSQL” (For UNIT V), 2011.
Reference Books	
1	Ramez Elmasri , Shamkant B. Navathe ,“Fundamentals of Database Systems”, 6th Edition, Addison-Wesley, 2011.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	RDBMS PostgreSQL By Prof Kannan Moudgalya - Principal Investigator of Spoken Tutorial Project | Indian Institute of Technology Bombay
Course Designed By: Mrs.W.ROSE VARUNA.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	L	M	S	S
CO3	S	S	S	S	S	S	L	M	M	S
CO3	M	M	M	S	S	L	L	L	M	M
CO4	L	L	S	S	S	L	L	M	S	M
CO5	M	M	S	S	S	M	L	L	S	S

*S-Strong; M-Medium; L-Low

Course code	21IT13D	WEB PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		Basics about Internet	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Students can familiar with Web pages and Web sites
2. Students are able to learn the latest technology in Web Progamming (HTML 5.0 and Java Script)
3. Students can develop their own Web Programming

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Familiar with web pages	K2
2	Understand how the browser and web pages are working	K2
3	Familiar with latest web programming skills	K3
4	Get a job with their own web Programming skills	K6
5	Became a freelance web page developer	K6

K1 - Remember; **K2** – Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction to Internet and HTML 5.0	9 -- hours

Introduction to internet - world - wide web : history - web browsers - Web servers - Uniform Resource Locator.

HT|ML 5.0 : Main Structure - structural elements - HTML5 with CSS

Text - Structuring main content areas - Adding blog posts and comments - WAI-ARIA - Redefined elements - Global attributes - Removed attributes

Unit:2	Forms, Video – Audio and Canvas	10 -- hours

Forms - New input types - New attributes - Backwards compatibility - form fields and error messages - Overriding browser defaults - Using JavaScript for DIY validation - Avoiding validation

Video and Audio - Native multimedia – Codecs - Rolling custom controls - Multimedia accessibility - synchronising media tracks

Canvas - Canvas basics - Drawing paths - Using transformers - Capturing Images
Pushing pixels - Animating your canvas paintings

Unit:3	**Data storage and additional features**	**10 -- hours**

Data Storage - Storage options - Web storage - Web SQL Database – IndexedDB

Offline - Pulling the plug - The cache manifest - Network and fallback - The manifest - The browse-server process - Application Cache - Debugging tips - Using the manifest to detect connectivity - Killing the cache

Drag and Drop - Getting into drag - Interoperability of dragged data - Drag any element - Adding custom drag icons – Accessibility

Unit:4	**Geolocation and Messaging**	**9 -- hours**

Geolocation -Sticking a pin in your user - API methods
Messaging and Workers - Chit chat with the Messaging API - Threading using Web Workers

Unit:5	**Representing Web Data**	**10 -- hours**

XML - documents and vocabularies - versions and declaration – namespaces; Eevent-oriented parsing: SAX - transforming xml documents; Selecting xml data: xpath; Template based transformations : xslt - displaying xml documents in browsers

Unit:6	**Contemporary Issues**	**2 hours**

Expert lectures, online seminars – webinars

	Total Lecture hours	**50 -- hours**

Text Book(s)

1	Deitel and Deitel and Goldberg, Internet and world wide web: How to program (third edition), Pearson prentice hall, 2003.
2	Robert w. Sebesta, Programming the WWW, Third edition, , Pearson Prentice hall, 2005.
3	Bruce Lawson , Remy Sharp, Introducing HTML 5.0, Pearson, Second Edition, 2012.
4	David Flanagan, JavaScript: The Definitive Guide, O'Relliy, Fifth edition, 2006.

Reference Books

1	Richard Clark, Christopher Murphy, Divya Manian, Oliver Studholme,,Beginning HTML5 and CSS3: The Web Evolved, Apress, 2008
2	Douglas Crockford, Java Script : The Good Parts, , O'relly, 2008

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://swayam.gov.in/nd2_aic20_sp11/preview
2	https://nptel.ac.in/courses/106/105/106105084/
Course Designed By: Mr.T.RAMESH.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	M	S	L	S	S	M	L	S	L
CO3	L	M	S	M	S	S	M	L	S	L
CO3	L	M	S	S	S	S	M	S	S	S
CO4	L	M	S	S	S	S	L	M	S	S
CO5	L	M	S	S	S	S	L	M	S	S

*S-Strong; M-Medium; L-Low

Course code	21IT13P	ADVANCED JAVA PROGRAMMING - LAB	L	T	P	C
Core/Elective/Supportive		Core	-	1	2	3
Pre-requisite		UG –Degree level: Basic Java, OOPs Concepts, JDBC/ODBC Connection.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. Objective of this course is to provide the ability to design console based applications, GUI based and web based applications.
2. Students will also be able to understand integrated development environment to create, debug and run
3. Multi-tier and enterprise-level applications. Design and analyze programs using remote method invocations (RMI).

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Implement the basic object oriented programming concepts like encapsulation, polymorphism and various AWT concepts, Overriding, Overloading Methods.	**K3**
2	Using advanced java Concepts for Develop Client/Server communication and Remote Method Invocation (RMI), URL Connection Establish.	**K3**
3	Initialize the Applet Program and Develop the delegation event model, Mouse event Handling.	**K3**
4	Connections establish between JDBC Vs ODBC, and also write the simple Servlet Program.	**K3**
5	Create the EJB , Message Driven Beans.	**K3**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Basic Concept	6 hours

Encapsulation, Inheritance, Polymorphism, Method Overriding, Method Overloading, Swing and AWT components- Java.sql packages.

Unit:2	Distributed Applications and Networking	8 hours

RMI-Parameters in RMI -JVM, Java Serialization, Java Networking, classes and interfaces, TCP/IP Client & Server Sockets, Http URL Connection, Datagrams.

Unit:3	Applets and Events	8 hours

Applets, HTML applet tags, Order of Applet initialization, Sizing graphics, passing parameters to applets, Mouse Event Handling, the Delegation Event Model.

Unit:4	**JDBC and Servlets**	**8 hours**
servlet program - Database Connectivity with JDBC, ODBC using Servlet, servlet development options, JavaScript.		
Unit:5	**JSP and EJB**	**6 hours**
JSP tags, Servlet vs. JSP, JSP Syntax Basics, JSP Directories - Entity Beans vs. Session Beans, Message Driven Beans.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
Applications in Advanced Java Programming		
	Total Lecture hours	**38 hours**

Text Book(s)

1	Java - The Complete Reference, Herbert Schildt, Tata McGraw-Hill, ninth edition, 2014.
2	Advanced Java for Students, Dr.AshwinMetha and Sarika Shah, The X team, published by SPD Pvt. Ltd, 2012.

Reference Books

1	Professional Java Server Programming, Subrahmanyan Allamaraju and Cedric Bues, Apress, SPD, 2005.
2	Java 2: Programmer's Reference, Herbert Schildt, Joseph O'Neil, 2000.
3	Jamie Jaworski, “Java Unleashed”, SAMS Techmedia Publications 1999.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/courses/106/105/106105191/, https://www.digimat.in/nptel/courses/video/106105191/L01.html, https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs08/ , https://www.youtube.com/watch?v=VksxhzfD8kQ, https://swayam.gov.in/nd1_noc19_cs84/preview
2	https://www.goeduhub.com/free-solution-for-different-universities-java-lab-experiments

Course Designed By: **Dr.R.VADIVEL.**

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	M	S	L	S	S	M
CO3	M	S	S	M	M	M	L	L	M	M
CO3	S	S	M	S	S	S	L	S	S	M
CO4	M	M	S	M	S	M	L	M	L	S
CO5	S	L	M	S	L	M	L	S	M	L

*S-Strong; M-Medium; L-Low

Course code	21IT13Q	RELATIONAL DATABASE MANAGEMENT SYSTEM LAB	L	T	P	C
Core/Elective/Supportive		Core	-	1	2	3
Pre-requisite		UG level – Database management system	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. This course aims at giving adequate exposure to students on the Database design and E-R modeling.
2. The course also facilitates students with hands on training on SQL, oracle and NoSQL (Mongo DB) within the RDBMS environment.
3. It helps the students to understand the various designing concepts, storage methods, querying and managing databases.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Model Entity Relationship with E-R diagrams	K3
2	Design database schema considering normalization and Relationships within database	K3
3	Write SQL queries to user specifications	K3
4	Develop triggers, procedures, user defined functions and design accurate and PLSQL programs in Oracle, XML and NoSQL.	K3
5	Use the database from a front end application	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction	6 hours

Basic SQL – DDL & DML, Views, Group operations, aggregate operations, System Operations in Oracle

Unit:2	Transaction Management	9 hours

Intermediate SQL –Joins, Subqueries, DCL operations, Advanced SQL – Nested tables, V-arrays

Unit:3	Object based Databases and XML	9 hours

ER Modeling, Database Design and Normalization

Unit:4	Parallel and Distributed Databases	6 hours

Stored procedures and using them in a client application, DBA mechanisms – Installation, Backup and recovery operations, Batch processing

Unit:5	**NoSQL**	**6 hours**
Mini Project - The course instructor shall provide real time problems / specifications to the students for mini project. The project shall be completed before the commencement of 2nd semester and a report shall be submitted.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
Latest applications in RDBMS		
	Total Lecture hours	**38 hours**

Text Book(s)	
1	Silberschatz, Korth, Sudarshan, "Database system concepts", 6th Edition, Tata McGraw Hill (For UNITS I, IV), 2011.
2	Ramakrishnan, Gehrke, "Database Management Systems", Tata McGraw Hill (For UNIT II, III), 2003.
3	Shashank Tiwari, "Professional NoSQL" (For UNIT V), 2011.
Reference Books	
1	Ramez Elmasri , Shamkant B. Navathe ,"Fundamentals of Database Systems", 6th Edition, Addison-Wesley, 2011.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	RDBMS PostgreSQL By Prof Kannan Moudgalya - Principal Investigator of Spoken Tutorial Project | Indian Institute of Technology Bombay
Course Designed By: Mrs.W.ROSE VARUNA.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	L	M	S	S
CO3	S	S	S	S	S	S	L	M	M	S
CO3	M	M	M	S	S	L	L	L	M	M
CO4	L	L	S	S	S	L	L	M	S	M
CO5	M	M	S	S	S	M	L	L	S	S

*S-Strong; M-Medium; L-Low

Second Semester

Course code	21IT23A	C# AND.NET PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		UG- Degree Level: Fundamental concepts in C, C++, OOPs , classes, structures and Enumerations.	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. To understand the basics of C# and .NET framework, learn in detail about C# classes, structures and enumerations

2. To design a data structure using arrays and lists in C#, know in detail about handling strings and file management to effectively create directories

3. To enable network connectivity between client and server and learn about .NET assemblies.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand code solution and Compile C# Projects within the .NET Framework .	**K2/K3**
2	Understand C# Operators , Expressions and looping Statement .	**K2/K3**
3	Understand and Implement Handling Array, string manipulation.	**K3/K4**
4	Demonstrate Knowledge of Object-Oriented Concepts Design User Experience and Functional requirements C#.NET application	**K4/K5**
5	Construct the Class, Methods and Implement Events and Exception Handling within .NET Application Environment	**K3/K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction to C#	9 hours

Evolution of C#, characteristics of C#, applications of C#, C# differ from C++ and JAVA. Understanding .NET: .NET Strategy, origins of .NET Technology, .NET Framework, CLR, Framework Base Classes, user and program interface,VS.NET, .NET languages, benefits. Overview of C#: simple C# program, namespaces, adding comments, returning a value, aliases namespaces, passing string objects, command line arguments, interactive input, mathematical functions, multiple main methods, compile time errors, program structure, program coding style. Literals, variables and data types: literals, variables, data types, value and reference types, declaration of variables, initialization of variables, default values, constant values, scope of variables, boxing and unboxing.

Unit:2	Operators and Expressions	9 hours

Operators: Arithmetic, relational, logical, assignment, increment and decrement, conditional, bitwise, special operators, Expressions: arithmetic expressions, evaluation of expressions, precedence of arithmetic expressions, type conversions, operator precedence and associativity, mathematical functions. Decision making and Branching: Decision making with IF statement, simple IF statement,

the IF…ELSE statement, Nesting of IF….ELSE statement, ELSE….IF ladder, switch statement, '?:' operator. Decision making with looping: WHILE statement, DO statement, FOR statement, foreach statement, jump in loops.		
Unit:3	**Methods in C#**	**10 hours**
Declaring methods, main methods, invoking methods, nesting of methods, method parameters, pass by value, pass by reference, output parameters, variable argument lists, method overloading. Handling Arrays: one-dimensional array, creating an array, two-dimensional array, variable-size array, System. Array class, array list class. Manipulating Strings: creating strings, string methods, inserting strings, comparing strings, finding substrings, mutable strings, array of strings, regular expressions.		
Unit:4	**Structures and Enumerations**	**10 hours**
Structures, structs with methods, nested structs, difference between classes and structs - enumerations, enumerator initialization, enumerator base types, enumerator type conversion. Classes and Objects: basic principles of OOP, defining a class, adding variables, methods, member access modifiers, creating objects, accessing class members, constructors, overloaded constructors, static members, static constructors, private constructors, copy constructors, destructors, member initialization, THIS reference. Inheritance and Polymorphism: classical inheritance, containment inheritance, defining a subclass, visibility control, defining subclass constructors, overriding methods, hiding methods, abstract classes and methods, sealed classes, sealed methods, polymorphism, extension methods.		
Unit:5	**Interface - Multiple Inheritance**	**10 hours**
Defining an interface, extending an interface, implementing interfaces, interfaces and inheritance, explicit interface implementation, abstract classes and interfaces. Operator overloading: overloadable operators, need for operator overloading, defining operator overloading, overloading unary and binary operators, overloading comparison operators. Delegates and Events: delegates, delegate declaration, delegate methods, delegate instantiation, delegate invocation, using delegates, multicast delegates, events. Managing console I/O operations: console class, console input, console output, formatted output, numeric formatting, standard numeric format, custom numeric format.		
Unit:6		**2 hours**
Expert lectures, online seminars - webinars		
Latest Development / Topics in C# and .NET Programming		
	Total Lecture hours	**50 hours**

Text Book(s)

1	E. Balagurusamy, Programming in C#: A Primer, fourth edition, Tata McGraw-Hill, 2015
2	Ian Griffiths, Matthew Adams, and Jesse Liberty, "Programming C# 4.0", Sixth Edition, O'Reilly Media, 2010.

Reference Books	
1	SvetlinNakov & Co, Fundamentals of computer programming with C#, The Bulgarian C# Programming Book, Sofia, 2013.
2	**Vystavel, Radek, "**C# Programming for Absolute Beginners", Apress publications, 2017.
3	E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2002.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.btechguru.com/training--dot-net--c-sharp-dot-net--framework--c-sharp-programming-tutorial-part-1-video-lecture--11285--27--139.html, https://www.youtube.com/watch?v=gfkTfcpWqAY, https://www.youtube.com/watch?v=GhQdlIFylQ8.
2	https://channel9.msdn.com/Series/CSharp-Fundamentals-for-Absolute-Beginners?l=Lvld4EQIC_2706218949
Course Designed By: **Dr.R.VADIVEL.**	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	L	S	S	M
CO3	S	S	S	M	M	M	L	M	M	S
CO3	S	S	M	S	L	S	L	S	S	L
CO4	S	L	S	M	S	M	L	M	L	S
CO5	S	M	S	S	L	S	L	S	M	M

*S-Strong; M-Medium; L-Low

Course code	21IT23B	GRAPHICS AND MULTIMEDIA SYSTEMS	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		Computer Graphics, Multimedia	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To give a brief understanding of computer graphics and input output devices.
2. To enable students to know about 2-D and 3-D geometrical transformations.
3. To describe the ways in which multimedia information is captured, processed, and rendered.
4. To introduce about various new multimedia image file formats such as TIFF and JFIF.
5. To learn the step by step process of how to develop non-computer and computer based animation.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Describe technical characteristics and performance of multimedia system and terminals.	K2
2	Design creative approach in application of multimedia devices, equipment and systems.	K6
3	Carry out experiments and measurements on the multimedia systems in laboratory conditions on real components and equipment.	K3
4	Interpret and analyze measurement results obtained on the multimedia system and components.	K4
5	Understand all file formats.	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

UNIT:1	INTRODUCTION TO COMPUTER GRAPHICS	9 HOURS

Introduction to Computer Graphics: Applications of Computer Graphics, Operations of Computer Graphics, Graphics Software Packages, Requirements, Graphical User Interface. Graphical I/O Devices: Raster Video Principles, Random Scan Devices, Graphics Accelerators and Graphics Co-Processors. Scan Conversion: Methods, Polynomial Method, DDA Algorithms, Bresenhams Algorithms.

UNIT:2	TRANSFORMATIONS	10 HOURS

2-D Geometrical Transformations: Basic Transformations, Homogeneous Coordinate System, Other Transformations, Combined Transformations, Inverse of Combined Transformations, 3-D Geometrical Transformations: Basic 3-D Transformations, 3-D Translation, Scaling, Rotation, Rotation about an Arbitrary Axis In Space, Other 3-D Transformations, 3-D Reflection, Reflection about any Arbitrary Plane, 3-D Shearing.

UNIT:3	**INTRODUCTION TO MULTIMEDIA**	**9 HOURS**
Introduction to Multimedia: Concepts of Multimedia, Types, Multimedia Data Streams, Hardware/Software Requirements, Applications, Multimedia Authoring, Digital Audio, MIDI, Image Compression Standards, Video Compression and Encoding, Hypertext and Hyper Media.		
UNIT:4	**FILE FORMATS**	**10 HOURS**
Graphics Image File Formats: Image File Formats, Raster Formats, Bitmap Format, Graphics Interchange Format, Joint Photographic Experts Group, Tagged Image File Format, Microsoft Image Extensions, Portable Network Graphics, BMP Format, Overview, Bitmap Compression, JPEG and JFIF, JPEG Encoding Steps, JFIF Format, GIF Format, GIF Format, GIF Extension Blocks, TIFF File Formats.		
UNIT:5	**TOOLS FOR WORLD WIDE WEB**	**10 HOURS**
Multimedia Tools in the Information Commons, Audio, Video, Photo, Text Scanning and OCR, Font Editing and Design Tools, Text Editing and Word Processing Tool, Image Editing Tool, Painting and Drawing Tools, Sound Editing Tool, Digitized Audio, MIDI, Comparison between MIDI and Digitized Audio, Advantages and Disadvantages of Digitized Audio and MIDI, Animation, Video and Digital Movie Tool, Video Formats.		
UNIT:6	**CONTEMPORARY ISSUES**	**2 HOURS**
Expert Lectures, Online Seminars – Webinars		
	TOTAL LECTURE HOURS	**50 HOURS**

Text Book(s)

1	Jeffrey J. McConnell, “Computer Graphics: Theory Into Practice”, Jones & Barlett Learning, 2006.
2	Jeffcoate, Judith, “Multimedia in Practice”, Prentice Hall, 2001.

Reference Books

1	Malay K. Pakhira, “Computer Graphics, Multimedia and Animation”, PHI learning, 2010.
2	Tay Vaughan, Multimedia making it Work‟, McGraw Hill, 1994.
3	Donald Hearn M. Pauline Baker, “Computer Graphics” C Version, Second Edition, Pearson Education, 2006.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Introduction to Computer Graphics, Dr. Prem Kalra, Dept of CSE, IIT.

Course Designed By: Dr. E. BOOPATHI KUMAR.

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	S	M	S	S	L
CO3	S	M	S	L	S	L	L	S	M	L
CO3	S	L	S	M	S	M	L	S	S	L
CO4	M	S	S	L	L	S	L	S	S	L
CO5	M	M	S	M	M	S	S	S	S	L

*S-Strong; M-Medium; L-Low

Course code	21IT23C	INFORMATION AND DATA SECURITY	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		UG level – Information and Data Security	Syllabus Version	2021-21		

Course Objectives:

The main objectives of this course are to:

1. This course focuses on the fundamentals of information security that are used in protecting both the information present in computer storage as well as information travelling over computer networks.
2. Interest in information security has been spurred by the pervasive use of computer-based applications such as information systems, databases, and the Internet.
3. Information security is enabled through securing data, computers, and networks. By the end of this course, student will be able to describe major information security issues and trends, and advise an individual seeking to protect data.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Recognize the information security policies, standards and Procedures for completeness and alignment with generally accepted practices	K2
2	Explain the functionalities of information security	K2
3	Describe Authentication and Security practice	K2
4	Analyze the root causes of cyber crime	K3
5	Implement suitable security techniques for a given problem	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Conventional and Modern Encryption	11 hours

Overview - Security Attacks - Security Services - Classical Encryption Techniques - Symmetric Cipher Model - Substitution Techniques - Transposition Techniques - Rotor Machines – Steganography - Block Ciphers and the Data Encryption Standard - The Data Encryption Standard - Advanced Encryption Standard - AES Key Expansion - Multiple Encryption and Triple DES.

Unit:2	Public key encryption	9 hours

Basic Concepts in Number Theory - The Euclidean Algorithm - Greatest Common Divisor - Finding the Greatest Common Divisor - Fermat‟s and Euler‟s Theorems - Fermat‟s Theorem - Euler‟s Totient Function - Euler‟s Theorem - The RSA Algorithm - Description of the Algorithm - Computational Aspects - The Security of RSA - Elliptic Curve Cryptography - Diffie-Hellman Key Exchange.

Unit:3	**Authentication and security practice**	**9 hours**
Cryptographic Hash Functions - Applications of Cryptographic Hash Functions - Two Simple Hash Functions - Requirements and Security - Hash Functions Based on Cipher Block Chaining - Secure Hash Algorithm (SHA) - SHA-3 - Digital Signatures - Elgamal Digital Signature Scheme - Schnorr Digital Signature Scheme - NIST Digital Signature Algorithm - Elliptic Curve Digital Signature Algorithm - RSA-PSS Digital Signature Algorithm.		
Unit:4	**Network security**	**10 hours**
Extensible Authentication Protocol - Cloud Computing - Cloud Security Risks and Countermeasures - Data Protection in the Cloud - Cloud Security as a Service - Transport-Level Security - Web Security Considerations - Secure Sockets Layer - Transport Layer Security – HTTPS - Wireless Network Security - Wireless Security - Mobile Device Security - Electronic Mail Security - Pretty Good Privacy - S/MIME – Domain Keys Identified Mail.		
Unit:5	**Data security**	**9 hours**
Securing Unstructured Data - Structured Data vs. Unstructured Data - At Rest, in Transit, and in Use - Approaches to Securing Unstructured Data – Databases - Applications - Networks – Computers - Storage (Local, Removable, or Networked) - Data Printed into the Physical World - Newer Approaches to Securing Unstructured Data - Data Loss Prevention (DLP) - Information Rights Management (IRM).		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
Latest developments/topics in Information and Data Security		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	William Stallings, “Cryptography & Network Security”, 6th Edition, Pearson Education, New Delhi 2013.
2	Mark Rhodes-Ousley ,“The Complete Reference Information Security”, Second Edition, Tata McGraw Hill 2013.
Reference Books	
1	Jason Andress,“ The Basics of Information Security”, Elsevier, 2011.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	Cyber Security By Dr.G.PADMAVATHI, Avinashilingam Institute for Home Science & Higher Education for Women, Coimbatore
Course Designed By: Mrs.W.ROSE VARUNA.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	**S**	**S**	**M**	**L**	**S**	**S**	**L**	**M**	**S**	**S**
CO3	**S**	**S**	**S**	**M**	**M**	**M**	**L**	**M**	**L**	**S**
CO3	**M**	**M**	**S**	**S**	**S**	**M**	**L**	**M**	**M**	**M**
CO4	**L**	**L**	**M**	**S**	**S**	**S**	**L**	**M**	**L**	**S**
CO5	**M**	**M**	**M**	**S**	**S**	**M**	**L**	**M**	**L**	**S**

*S-Strong; M-Medium; L-Low

Course code	21IT23D	PYTHON PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		Knowledge about the Internet and any one of the Scripting Languages	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. Understand the basics of Python Programming
2. Get a Job in the IT industry as a python programmer
3. Use Python programming in their research

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basics of Python Programming	K2
2	Understand OOPs concepts	K2
3	Design and Develop Python Programming	K3
4	Get a job in the IT industry as a Python Programmer	K6
5	Work as a freelance Python Programmer	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Introduction to Python	9 -- hours

Introduction to Python : Python interpreter - Overview of programming in Python - Python built-in types - Arithmetic in Python - Program input and Program output- Variables and assignment.

Control Statements: -if statements - while statement -for statements

Unit:2	List, Dictionary, Tuples and Functions	10 -- hours

Strings and string operations - List basics - List operations - Dictionaries - Dictionary basics and Tuples

Functions - formal arguments - variable-length arguments

Exceptions - detecting and handling exceptions.

Unit:3	OOP in Python	10 -- hours

Classes - class attributes - instances - instance attributes - binding and method invocation - inheritance - polymorphism - Built-in functions for classes and instances.

Unit:4	**File Handling**	**10 -- hours**
Files and input/output - reading and writing files - methods of file objects - using standard library functions - dates and times		
Unit:5	**Database and Web programming**	**9 -- hours**
Python database application programmer's interface (DB- API) - connection and cursor objects - Type objects and constructors - python database adapters. Creating simple web clients - python web application frameworks: Django.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**50 -- hours**

Text Book(s)	
1	Wesley J. Chun, Core Python Programming, 2nd Edition , Pearson Education, 2006
2	Magnus Lie Hetland, Beginning Python: From Novice To Professional, Dream Tech Press, Second Edition, 2008.

Reference Books	
1	Python Tricks: A Buffet of Awesome Python Features, Dan Bader,2017
2	Harsh Bhasin, Python for Beginners, New Age International (P) Ltd Publishers,2017

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://docs.python.org/tutorial/
2	https://nptel.ac.in/courses/106/106/106106182/

Course Designed By: Mr.T.RAMESH.

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	L	S	S	S	M	S	M	S
CO3	L	S	L	S	S	S	M	S	M	S
CO3	S	S	S	S	S	S	M	S	M	M
CO4	L	M	M	M	S	S	M	S	M	M
CO5	L	M	M	M	S	S	M	S	M	M

*S-Strong; M-Medium; L-Low

Course code	21IT23P	C# AND.NET PROGRAMMING - LAB	L	T	P	C
Core/Elective/Supportive		Core	-	1	2	3
Pre-requisite		UG- Degree Level: C& C++ Program, OOPs Concepts.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. This course presents the Introduction to .NET frame work, C# and its features.
2. The course also facilitates the students to enable learn the fundamentals of .NET and C#.
3. It helps the students to Understood the .NET framework, Learnt Programming techniques in C#.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Develop and Implement the Simple C# Program, and how do to work the Mathematical Functions in C#.	**K3**
2	Using various operators, expressions and loop concepts, Branch conditions in C# programming	**K3**
3	Initialize the Array Types and Array Handling , Manipulating Strings in C# Programming.	**K3**
4	Implement the basic object oriented programming concepts like encapsulation, polymorphism and member Function, Constructor, Destructors.	**K3**
5	Implement the operator Overload Methods, Manage I/O Operations, Event Delegation Methods.	**K3**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction to C#	8 hours

User and program interface, simple C# program, mathematical functions, multiple main methods, compile time errors, program structure, program coding style.

Unit:2	Operators and Expressions	8 hours

Arithmetic & relational and Logical operators, arithmetic expressions, IF statement**,** IF…Else Statement, switch statement, WHILE, DO statement, FOR statement, foreach statement.

Unit:3	Methods in C#	8 hours

one-dimensional array, creating an array, two-dimensional array, creating strings, string methods, inserting strings, comparing strings, finding substrings, mutable strings, array of strings

Unit:4	Structures and enumerations	6 hours

Accessing class members, constructors, static members, static constructors, copy constructors, destructors, classical inheritance, containment inheritance, overriding methods, polymorphism.

Unit:5	**Interface - Multiple Inheritance**	**6 hours**
overloadable operators, overloading unary and binary operators, delegate methods, delegate instantiation multicast delegates, events, standard numeric format, custom numeric format.		
Unit:6		**2 hours**
Expert lectures, online seminars - webinars		
Applications in C# and .NET Programming.		
	Total Lecture hours	**38 hours**

Text Book(s)	
1	E. Balagurusamy, Programming in C#: A Primer, fourth edition, Tata McGraw-Hill, 2015
2	Ian Griffiths, Matthew Adams, and Jesse Liberty, "Programming C# 4.0", Sixth Edition, O'Reilly Media, 2010.

Reference Books	
1	SvetlinNakov& Co, Fundamentals of computer programming with C#, The Bulgarian C# Programming Book, Sofia, 2013.
2	Vystavel, Radek, "C# Programming for Absolute Beginners", Apress publications, 2017.
3	E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2002.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.btechguru.com/training--dot-net--c-sharp-dot-net--dot-net-platform--c-sharp-dot-net-programming-video-lecture--11278--27--139.html
2	https://www.youtube.com/watch?v=m30G-c6i648, https://www.youtube.com/watch?v=F-0abgPXjLA

Course Designed By: **Dr.R.VADIVEL.**

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	L	S	S	M
CO3	S	S	S	M	M	M	L	L	M	S
CO3	S	S	M	S	L	S	L	S	S	M
CO4	M	L	S	M	S	M	L	M	L	S
CO5	S	M	S	S	L	M	L	S	M	L

*S-Strong; M-Medium; L-Low

Course code	21IT23Q	PYTHON PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		Knowledge about the Internet and any one of the Scripting Languages	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. Understand the basics of Python Programming
2. Get a Job in the IT industry as a python programmer
3. Use Python programming in their research

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basics of Python Programming	K2
2	Understand OOPs concepts	K2
3	Design and Develop Python Programming	K3
4	Get a job in the IT industry as a Python Programmer	K6
5	Work as a freelance Python Programmer	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction to Python	6 -- hours

Control Statements: -if statements - while statement -for statements

Unit:2	List, Dictionary, Tuples and Functions	8 -- hours

Strings and string operations - List operations - Dictionaries - Tuples

Functions - Exceptions handling

Unit:3	OOP in Python	8 -- hours

Classes - class attributes - instances - instance attributes - binding and method invocation - inheritance - Built-in functions for classes and instances.

Unit:4	File Handling	8 -- hours

Files and input/output - reading and writing files - methods of file objects - using standard library functions - dates and times

Unit:5	**Database and Web programming**	**6 -- hours**
Python database application programmer‟s interface (DB- API) - connection and cursor objects - Type objects and constructors - python database adapters. Creating simple web clients - python web application frameworks: Django.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**36 -- hours**

Text Book(s)	
1	Wesley J. Chun ,Core Python Programming,, 2nd Edition , Pearson Education, 2006
2	Magnus Lie Hetland, Beginning Python: From Novice To Professional, Dream Tech Press, Second Edition, 2008.

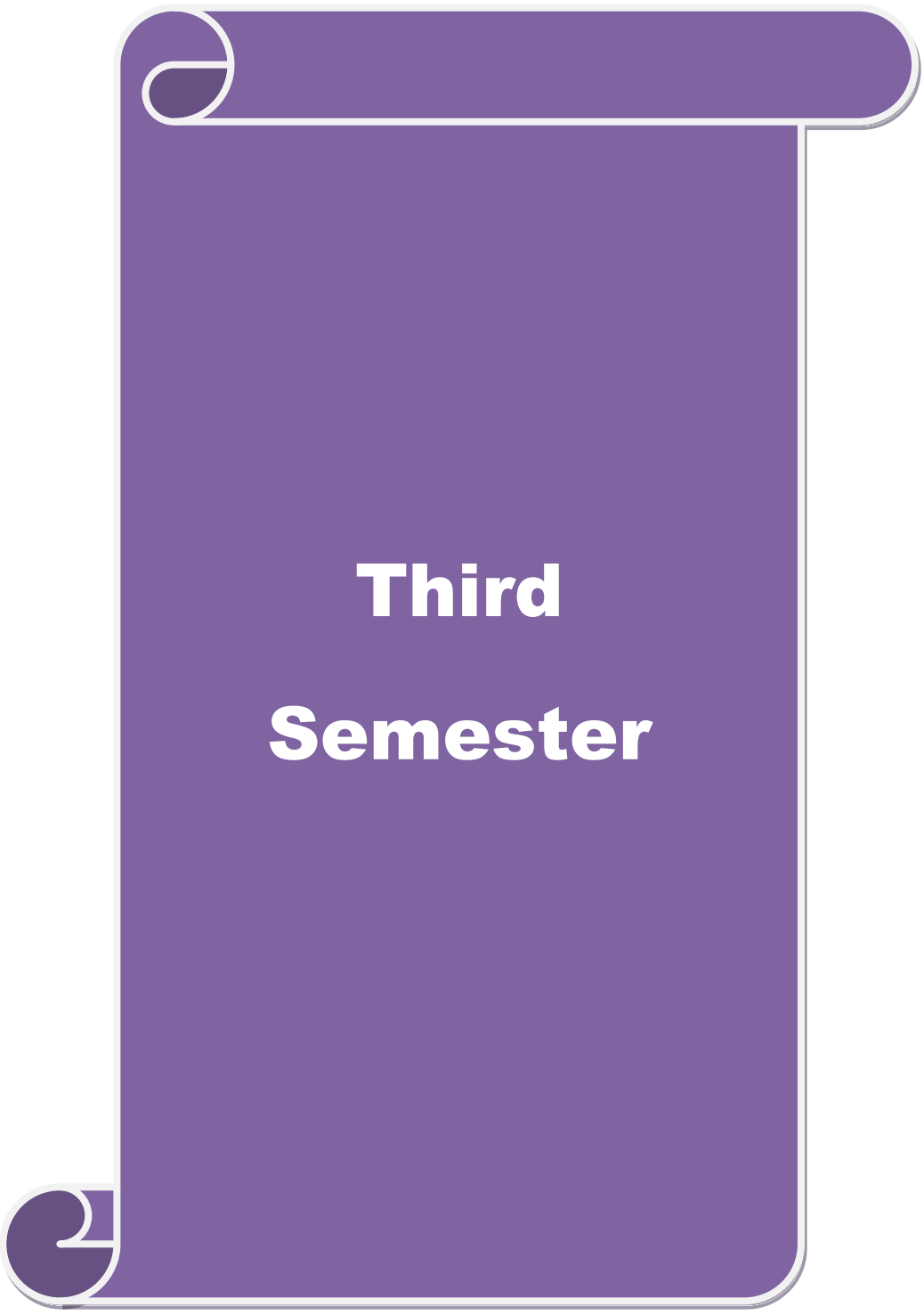
Reference Books	
1	Python Tricks: A Buffet of Awesome Python Features, Dan Bader,2017
2	Harsh Bhasin, Python for Beginners, New Age International (P) Ltd Publishers,2017

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://docs.python.org/tutorial/
2	https://nptel.ac.in/courses/106/106/106106182/

Course Designed By: Mr. T.RAMESH.

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	L	S	S	S	M	S	M	S
CO3	L	S	L	S	S	S	M	S	M	S
CO3	S	S	S	S	S	S	M	S	M	M
CO4	L	M	M	M	S	S	M	S	M	M
CO5	L	M	M	M	S	S	M	S	M	M

*S-Strong; M-Medium; L-Low


Third
Semester

Course code	21IT33A	EMBEDDED SYSTEMS	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		UG - Degree Level: OS Concepts, Software & Hardware Components, IC, Processor and Controller, Example of Embedded Systems.	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. To understand the overview and applications of embedded systems along with its components.
2. To enable the students to understand the embedded system based on various examples, and brief analysis of Real Time Operating System concepts.
3. To enable the students to learn the basic functions, principles and designing of 8051 microcontrollers, clear view of digital integrated circuits and embedded product life cycle.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand basic concepts in the embedded computing systems area.	**K2/K3**
2	Determine the optimal composition & characteristics of an embedded system and Example of Embedded Systems.	**K2/K4**
3	Develop hardware-software complex with the use of the National Instruments products, and Embedded OS.	**K2/K3**
4	An ability to design a system, component, or process to meet desired needs within realistic constraints.	**K2/K3**
5	Understand the Various types ICs and it benefits for embedded system design.	**K2/K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction to Embedded systems	9 hours

Applications embedded systems features, characteristics of embedded systems, Intel 8085 Microprocessor features, 8085 microprocessor architecture, microprocessor Vs Microcontroller**.** **Embedded systems hardware**: microcontroller unit (MCU), 8-bit MCU, memory of embedded systems.

Unit:2	Examples of Embedded Systems	9 hours

Mobile Phones, Radio Frequency Identification (RFID), wireless sensor Networks (WISENET), robotics, biomedical applications, brain machine interface. **Buses and protocols:** definition, on-board buses for embedded systems, external buses automotive buses, wireless communication protocols.

Unit:3	Operating System Concepts	10 hours

Embedded OS, NOS, Layers, Functions of OS, kernel, tasks/processes, scheduling algorithms, threads, interrupt handling, IPC, task synchronization, semaphores, priority inversion, device drivers. **Real-time OS:** real time tasks, real time systems, types, real time OS, real time scheduling

algorithms, rate monolithic algorithm.		
Unit:4	**8051 Microcontrollers**	**10 hours**
History of 8051, 8051 programmer's perspective assembly language programming, internal RAM, 8051 stack, PSW, assembler directives, storing data in cache memory (ROM), instruction set, port programming, subroutines (procedures).		
Unit:5	**Automated Design of Digital ICs**	**10 hours**
History of ICs, types of digital ICs, ASIC design, **Embedded product lifecycle management:** hardware software co design**,** modeling of systems, embedded product development **life cycle management,** life cycle models. **Embedded design**: A typical example, product design, the design process and testing.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
Latest Development/ Topics in Embedded Systems.		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	Lyla B.Das, "Embedded Systems: An Integrated Approach', Pearson , 2013.
2	Rajkamal, 'Embedded system-Architecture, Programming, Design', TMH, 2011.
Reference Books	
1	G.K.Kharate, Digital Electronics, Oxford University press, Sixth impression 2012.
2	A.P.Godse, G.A.Godse, Microprocessor and Microcontroller, Technical Publication Pune, First Edition 2010.
3	David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian reprint 2000.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://swayam.gov.in/nd1_noc20_cs14/preview, https://swayam.gov.in/nd1_noc20_ee98/preview
2	http://www.nptelvideos.in/2012/11/embedded-systems.html
3	https://nptel.ac.in/courses/108/105/108105057/, https://www.youtube.com/watch?v=y9RAhEfLfJs
Course Designed By: **Dr.R.VADIVEL.**	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	L	S	S	L
CO3	S	S	S	M	M	M	L	L	M	S
CO3	S	S	M	S	M	S	L	S	S	M
CO4	M	M	S	M	S	M	L	M	L	S
CO5	S	M	S	S	L	M	L	S	M	M

*S-Strong; M-Medium; L-Low

Course code	21IT33B	SOFTWARE TESTING	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		Software Engineering	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. To study the basic concepts of Software testing
2. To understand the test case scenarios
3. To learn different testing strategies
4. To study the various applications of testing and its challenges in commercial environments.
5. To became a software tester in the industry

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand about the Types of errors and its consequences.	K2
2	Apply various methods and tools of testing and maintenance of software's.	K3
3	Create test strategies and plans.	K6
4	Design test cases, prioritize and execute them.	K6
5	Check developed software with appropriate tools	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

UNIT:1	INTRODUCTION	8 HOURS

Purpose of Software testing – Some Dichotomies – a model for testing – Playing pool and consulting oracles – Is complete testing possible – The Consequence of bugs – Taxonomy of Bugs – Some Bug Statistics – Software testing Fundamentals – Test case Design – Introduction of Black Box Testing and White Box testing.

UNIT:2	TEST CASE DESIGN	11 HOURS

Flow Graphs and Path testing – Path Testing Basics - Predicates, Path Predicates and Achievable Paths - Path Sensitizing – Path Instrumentation – Implementation and Application of Path Testing – Transaction Flow Testing – Transaction Flows – Transaction Flow Testing Techniques – Implementation Comments.

UNIT:3	LEVELS OF TESTING	10 HOURS

Data Flow Testing – Basics – Data Flow Testing Strategies – Applications, Tools and effectiveness – Metrics and Complexity – Linguistic Metrics – Structural Metrics – Hybrid Metrics – Syntax Testing – Grammar for formats – Test Case Generation – Implementation and Application.

UNIT:4	**TESTING AND GRAPHS**	**10 HOURS**
Logic Based Testing – Motivational Overview – Decision tables – Path Expressions – KV Charts – Simple Forms – Three Variables – Four Variables – More Testing Strategies – Specifications – States, State Graphs and transition Testing – State Graphs – Good & bad states – State Testing.		
UNIT:5	**TESTING TOOLS AND WEB SERVICES**	**9 HOURS**
Testing in Engineering Criteria for Technologies – Testing Object Oriented Software - Testing Web Applications and Web Services - Testing GUIs – Building Testing Tools – Challenges in Testing Software		
UNIT:6	**CONTEMPORARY ISSUES**	**2 HOURS**
Expert Lectures, Online Seminars – Webinars		
	TOTAL LECTURE HOURS	**50 HOURS**

Text Book(s)	
1	Boris Beizer, Software Testing Techniques, Dreamtech Press, Second Edition – 2007.
Reference Books	
1	Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.
2	Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006.
3	Paul Ammann, Jeff Offutt, “Introduction to Software Testing”, Cambridge university press, 2008
4	Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons, Second Edition, 2004
5	Marnie. L. Hutcheson, Software Testing Fundamentals, Wiley-India, 2007.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	Software Engineering, Prof. Rajib Mall, Dept of CSE, IIT Kharagpur.
2	

Course Designed By: Dr. E. BOOPATHI KUMAR.

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	M	S	M	S	S	S
CO3	S	S	S	M	S	S	L	L	S	M
CO3	M	S	S	S	S	S	M	M	S	L
CO4	L	S	S	S	S	M	L	S	S	S
CO5	S	S	S	L	L	L	M	M	M	S

*S-Strong; M-Medium; L-Low

Course code	21IT33C	CLOUD COMPUTING	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		UG level – CLOUD COMPUTING	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. Students will gain knowledge on Cloud computing fundamentals and Architecture by learning Cloud computing toolkits
2. Cloud computing paradigm covers a range of distributed computing, hosting and access solutions, including service-based computing
3. The objective of the course is to provide comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Describe the key technologies, architecture, strengths, limitations and applications of Cloud computing	K2
2	Explain the types and service models of cloud.	K2
3	Describe the core issues such as security, privacy, and interoperability in cloud platform.	K2
4	Apply suitable technologies, algorithms, and applications in cloud computing driven systems	K3
5	Provide appropriate cloud computing solutions for the current scenario	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction	10 hours

Cloud computing – Roots of Cloud Computing – From Mainframes to Clouds - SOA, Web Services, Web 2.0, and Mashups - Grid Computing - Utility Computing - Hardware Virtualization - Layers and Types of Clouds – Desired Features of a Cloud – Cloud Infrastructure Management – Infrastructure as a Service Providers – Platform as a Service providers – Challenges and Risks.

Unit:2	Integration as a Service	10 hours

Introduction - The Evolution of SaaS - The Challenges of SaaS Paradigm - New Integration Scenarios - The Integration Methodologies - SaaS Integration Products and Platforms - Jitterbit - Boomi Software - OpSource Connect - SnapLogic - The Pervasive DataCloud - Bluewolf - Online MQ - CloudMQ - Linxter - SaaS Integration Services - A Framework of Sensor—Cloud Integration - SaaS Integration Appliances.

Unit:3	**Infrastructure as a Service**	**10 hours**
The Anatomy of Cloud Infrastructures - Distributed Management of Virtual Machines - Reservation-Based Provisioning of Virtualized Resources - Provisioning to Meet SLA Commitments - Distributed Management of Virtual Infrastructures - VM Model and Life Cycle - VM Management - Further Reading on OpenNebula - Scheduling Techniques for Advance Reservation of Capacity - Capacity Management to meet SLA Commitments.		
Unit:4	**Secure Distributed data storage in Cloud Computing**	**9 hours**
Introduction - Cloud Storage: from LANs TO WANs - Moving From LANs to WANs - Existing Commercial Cloud Services - Vulnerabilities in Current Cloud Services - Bridge the Missing Link - Technologies for Data Security in Cloud Computing - Database Outsourcing and Query Integrity Assurance - Data Integrity in Untrustworthy Storage - Web-Application-Based Security - Multimedia Data Security Storage - Open Questions and Challenges.		
Unit:5	**Data security in Cloud**	**9 hours**
An Introduction to the Idea of Data Security - The Current State of Data Security in the Cloud - Cloud Computing and Data Security Risk - Cloud Computing and Identity – Identity, Reputation, and Trust - Identity for Identity's Sake - Cloud Identity: User-Centric and Open-Identity Systems - The Philosophy of User-Centric Identity - User-Centric but Manageable - What Is an Information Card? - Using Information Cards to Protect Data - Weakness and Strengths of Information Cards - Cross-Border Aspects of Information Cards - The Cloud, Digital Identity, and Data Security - Content Level Security—Pros and Cons - Future Research Directions.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
Latest developments/topics in Cloud Computing		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	Rajkumar Buyya, James Broberg, Andrzej Goscinski, "CLOUD COMPUTING Principles and Paradigms", Wiley publications 2011.
Reference Books	
1	Haley Beard," Cloud Computing best practices".
2	Michael Miller ,"Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online" 2009.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	Cloud computing By Prof. Soumya Kanti Ghosh | IIT Kharagpur
Course Designed By: Mrs.W.ROSE VARUNA.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	**S**	**S**	**L**	**S**	**S**	**M**	**L**	**M**	**M**	**S**
CO3	**S**	**S**	**M**	**S**	**S**	**M**	**L**	**S**	**M**	**L**
CO3	**S**	**S**	**M**	**S**	**S**	**M**	**L**	**S**	**M**	**M**
CO4	**S**	**S**	**M**	**S**	**S**	**M**	**L**	**S**	**M**	**M**
CO5	**S**	**S**	**M**	**S**	**S**	**M**	**L**	**M**	**M**	**M**

*S-Strong; M-Medium; L-Low

Course code	21IT33D	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Core/Elective/Supportive		Core	3	1	-	4
Pre-requisite		Basics about the Networking, TCP/IP and Programming Skills	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To understand the User Interface Design, Back end databases, other services for mobile applications.
2. To get a job using mobile application development skills
3. To get exposure to Android and IOS development environment

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the principles of Mobile networks	K2
2	Understand the different mobile network technology	K2
3	Get familiar with Android and IOS environment	K3
4	Design and develop Mobile application using Android and IOS.	K6
5	Get a job with their own skills.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Mobile Communication and Technology	10 -- hours

Mobile Communication - Mobile Computing - Mobile Computing Architecture
Mobile Communication and Technologies :GSM - CDMA - Bluetooth –ZigBee - IrDA - RFID – IEEE 802.11 – GPS - NFC

Unit:2	5G Communication Technology	10 -- hours

5G System Concepts – 5G Architecture – Functional Architecture – Machine type Communication – Device to Device 4G to 5G

Unit:3	User Interface Design and Files/Directories	10 -- hours

User Interface Design : Fundamental - Views - Layouts – Drawable Resources - Resolution and Density Independence - Creating and Using Menus- Intents – Adapters - Internet Resources - Dialogs

Files and Directories: Files - Saving – retrieving – file Management - Databases – SQLite - Cursors and Content –Values – Working with SQlite.		
Unit:4	**Networking, Location-Based Services and Multimedia Services**	**10 -- hours**
Networking and Emailing services - Maps – Geocoding – Location - Based Services – Alarm – service – Toast – Threads – using sensors – Graphics – Media Player – Camera – Video – Working with Bluetooth, NFC and WiFi – Handling Telephony and SMS – Email.		
Unit:5	**Android and IOS**	**8 -- hours**
Android: Development Tools – Architecture - Manifest - Application Life Cycle - Application Priority and Process States IOS: iPhone Developer - Apple Developer Connection - Memory Management - Fundamental iPhone Design Patterns – Tables and Views		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**50 -- hours**

Text Book(s)	
1	Ashok K Talukder and Roopa R Yavagal, Mobile Computing, Tata McGraw Hill, 2005.
2	Christopher Cox, “An introduction to LTE – LTE, LTE-Advanced, SAE and 4G Mobile Communications”, John Wiley & Sons, 2012.
3	Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley, 2010.
4	Alasdair Allan, “iPhone Programming”, O’Reilly, 2010.
5	Afif Osseiran, Jose F. Monserrat, Pathick Marsch, 5G Mobile Wireless Communication, Cambridge University Press, 2016

Reference Books	
1	Pradeep Kothari, “Android Application Development” Dream tech Press, 2015
2	Matt Neuburg, Programming IOS 13 : Dive Deep into Views, View Controllers and Frame works,Orelly, 2019.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc16_cs13

Course Designed By: Mr. T.RAMESH.

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	S	L	S	S	L	S	S	M
CO3	L	M	S	S	S	S	L	S	S	S
CO3	L	L	S	S	S	S	S	S	S	S
CO4	M	M	S	S	S	S	L	M	S	S
CO5	M	M	S	S	S	S	M	M	S	M

*S-Strong; M-Medium; L-Low

Course code	21IT33P	SOFTWARE TESTING - LAB	L	T	P	C
Core/Elective/Supportive		Core	-	1	2	3
Pre-requisite		Software Engineering	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. To get on hand experience on software testing
2. To design and develop their own test case scenarios
3. To design and develop their own testing strategies.
4. To study and exposure to various commercial testing software.
5. To get a job in the field of software testing.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Write and test a program to login a specific web page.	K5
2	Understand the automation testing approach.	K2
3	Conduct a test suite for any web sites.	K5
4	Design test case for developed software.	K6
5	Create errors and debugging it.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

UNIT:1	INTRODUCTION	7 HOURS

Bug Statistics – Software Testing – Test case Design –Black Box Testing and White Box testing.

UNIT:2	TEST CASE DESIGN	8 HOURS

Flow Graphs and Path testing – Path Sensitizing – Path Instrumentation – Implementation and Application of Path Testing – Transaction Flow Testing.

UNIT:3	LEVELS OF TESTING	7 HOURS

Data Flow Testing – Metrics and Complexity – Linguistic Metrics – Structural Metrics – Hybrid Metrics – Syntax Testing – Test Case Generation.

UNIT:4	TESTING AND GRAPHS	7 HOURS

Logic Based Testing – Decision tables – Path Expressions – KV Charts – States, State Graphs and Transition Testing – State Graphs – State Testing.

UNIT:5	TESTING TOOLS AND WEB SERVICES	7 HOURS

Testing Object Oriented Software - Testing Web Applications and Web Services -

Testing GUIs – Building Testing Tools.		
UNIT:6	**CONTEMPORARY ISSUES**	**2 HOURS**
Expert Lectures, Online Seminars – Webinars		
	TOTAL LECTURE HOURS	**38 HOURS**

Text Book(s)

1	Boris Beizer, Software Testing Techniques, Dreamtech Press, Second Edition – 2007.

Reference Books

1	Ron Patton, "Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007.
2	Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
3	Paul Ammann, Jeff Offutt, "Introduction to Software Testing", Cambridge university press, 2008
4	Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons, Second Edition, 2004
5	Marnie. L. Hutcheson, Software Testing Fundamentals, Wiley-India, 2007.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Software Engineering, Prof. Rajib Mall, Dept of CSE, IIT Kharagpur.

Course Designed By: Dr. E. BOOPATHI KUMAR.

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	S	M	S	M	S	M	S
CO3	S	M	S	S	L	S	L	M	L	S
CO3	S	S	S	S	S	M	S	L	M	M
CO4	M	S	S	S	S	L	S	S	L	S
CO5	L	S	S	S	S	S	S	S	M	S

*S-Strong; M-Medium; L-Low

Course code	21IT33Q	MOBILE APPLICATION DEVELOPMENT LAB	L	T	P	C
Core/Elective/Supportive		Core	-	1	2	3
Pre-requisite		Knowledge about the Internet, web and Mobile Networks	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To understand development of mobile applications.
2. To understand User Interface Design, Back end databases, other services for mobile applications.
3. To get exposure to Android and IOS development environment

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	To understand User Interface Design, Back end databases, other services for mobile applications	K2
2	Understand the different mobile network technology	K2
3	Get familiar with Android and IOS environment	K3
4	Design and develop Mobile application using Android and IOS.	K6
5	Get a job with their own skills.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Mobile Communication and Technology Implementation	8 -- hours

Bluetooth –ZigBee - IrDA - RFID – IEEE 802.11 – GPS – NFC - Delivery of voice and text message

Unit:2	User Interface Design and Files/Directories	8 -- hours

User Interface Design - Files and Directories

Unit:3	Databases and Networking	8 -- hours

Databases – SQLite - Cursors and Content –Values – Working with SQlite

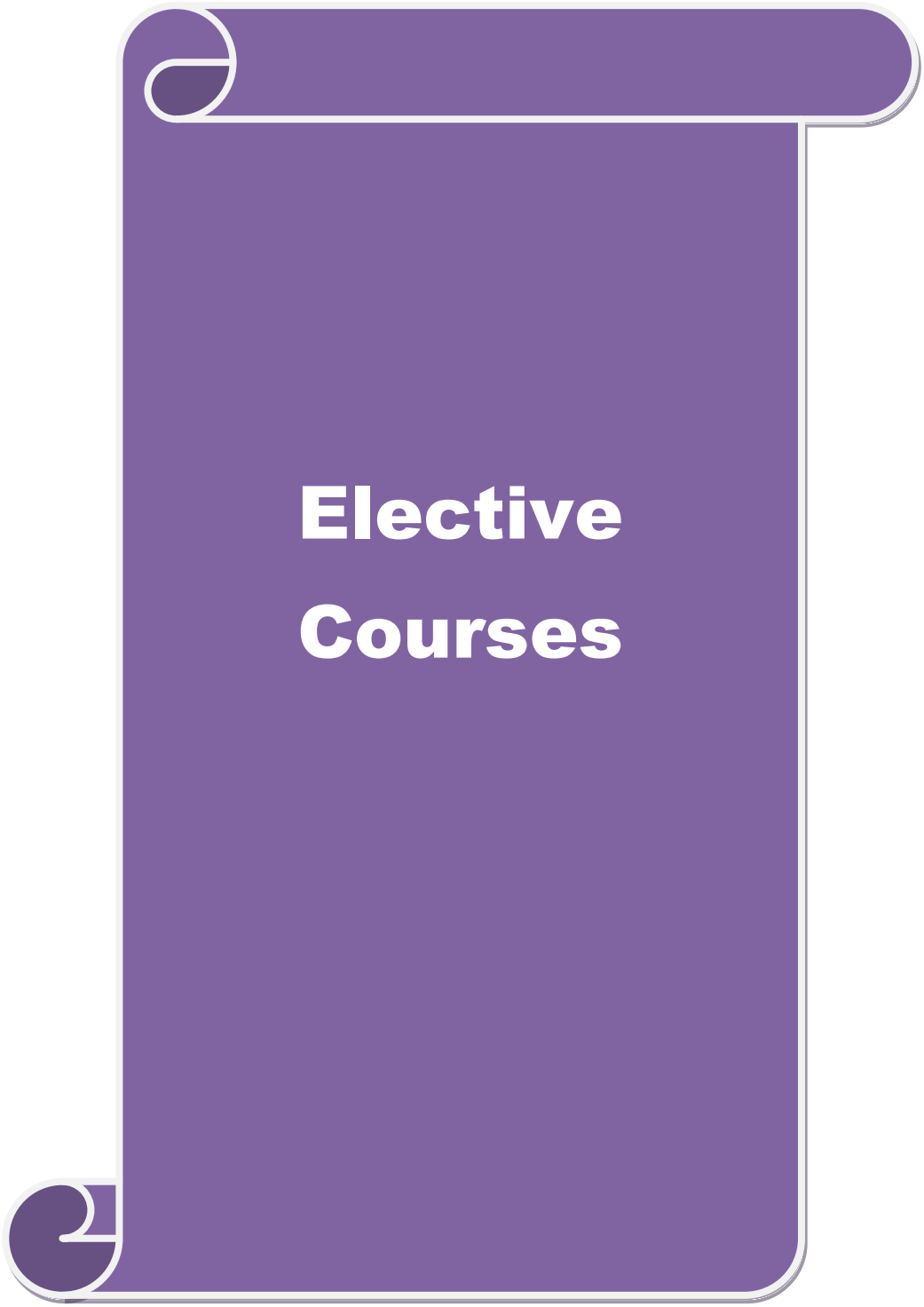
Networking and Emailing services - Maps – Geocoding – Location - Based Services – Alarm – service – Toast – – using sensors – Graphics – Media Player – Camera – Video

Unit:4	**Android**	**6 -- hours**
Android Application Development		
Unit:5	**IOS**	**6 -- hours**
IOS: iPhone Developer - Apple Developer Connection - Memory Management - Fundamental iPhone Design Patterns – Tables and Views		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**38 -- hours**

Text Book(s)	
1	Ashok K Talukder and Roopa R Yavagal, Mobile Computing, Tata McGraw Hill, 2005
2	Christopher Cox, "An introduction to LTE – LTE, LTE-Advanced, SAE and 4G Mobile Communications", John Wiley & Sons, 2012.
3	Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
4	Alasdair Allan, "iPhone Programming", O'Reilly, 2010.
Reference Books	
1	Pradeep Kothari, "Android Application Development" Dream tech Press, 2015
2	Matt Neuburg, Programming IOS 13 : Dive Deep into Views, View Controllers and Frame works, Orelly, 2011
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc16_cs13
Course Designed By: Mr. T.RAMESH.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	S	L	S	S	L	S	S	M
CO3	L	M	S	S	S	S	L	S	S	S
CO3	L	L	S	S	S	S	S	S	S	S
CO4	M	M	S	S	S	S	L	M	S	S
CO5	M	M	S	S	S	S	M	M	S	M

*S-Strong; M-Medium; L-Low


Elective
Courses

Course code	21ITE01	DIGITAL IMAGE PROCESSING	L	T	P	C
Core/Elective/Supportive		Elective	3	1	-	4
Pre-requisite		Degree Level - Digital Electronics, Probability and Statistics, Calculus, Mathematics, Digital signal processing.	Syllabus Version	2021 -21		

Course Objectives:

The main objectives of this course are to:

1. To study basic image processing techniques for solving real problems.
2. To study the image transform and Image enhancement techniques in image processing.
3. To study the Image compression and Segmentation procedures.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand about the fundamentals of Digital Image Processing.	K2
2	Describe about advanced concepts in image compression and segmentation.	K2
3	Apply, design and implement solutions for digital image processing problems.	K3
4	Describe and apply the concepts of feature selection and extraction for digital image retrieval.	K4
5	Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Digital Image Fundamentals	9 hours

Digital Image, Applications of Digital Image Processing- Elements of Digital Image Processing- Digital Camera, Line Scan CCD Sensor – Display Element Perception – Luminance – Brightness, Contrast- Color Models – RGB, CMY, HSI..

Unit:2	Image Transform	9 hours

Fourier Transforms- Unitary Transform- Properties of Unitary Transform – 2D DFT – DCT- Discrete Wavelet Transform- Hotelling Transform – SVD Transform – Slant, Hadamard Transform, Haar Transforms.

Unit:3	Image Enhancement and Restoration	10 hours

Contrast Stretching – Intensity Level Slicing – Histogram Equalization – Spatial Averaging – Smoothing – Maximum, Minimum, Median filtering – Inverse Filtering – Wiener Filtering - Constrained Least Square Filtering - Geometric Mean Filter– Edge Detection – Degradation Model –Estimating the Degradation Function.

Unit:4	Image Compression	10 hours

Huffman's Coding – Binary Codes – Predictive Coding – Bit Plane Coding - Arithmetic Coding - Run Length Coding- Transform Coding – JPEG and MPEG Coding.		
Unit:5	**Image Segmentation**	**10 hours**
Point, Line and Edge Detection: Detection of Isolated Points – Line Detection – Edge Models – Basic Edge Detection – Thresholding: Basic Global thresholding – Multiple Thresholds – Variable Thresholding – Region based Segmentation: Region Growing – Region Splitting and Merging.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
Latest developments/topics in Digital Image Processing.		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	Gonzalez R.C and Woods R. E, "Digital image processing", Pearson/Prentice Hall, Fourth Edition, 2018.
2	S.Jayaraman, S.Esakkirajan and T.Veerakumar, "Digital Image Processing", Tata McGraw Hill Education Private Limited, 2015
Reference Books	
1	Anil K Jain "Fundamentals of Digital image processing", Pearson, First Edition, 2015.
2	S.Annadurai and R.Shanmugalakshmi, "Fundamentals of Digital Image Processing", Pearson Education, 2007.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://swayam.gov.in/nd1_noc19_ee55/preview
2	https://www.classcentral.com/course/swayam-digital-image-processing-14005
Course Designed By: Dr.M.SUNDARESAN.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	L	M	L	M	L	M	M	M	M
CO3	M	M	L	M	S	M	L	M	M	L
CO3	M	S	M	L	M	M	S	M	L	M
CO4	M	M	S	S	M	S	S	M	L	M
CO5	S	S	M	M	M	S	S	M	M	S

*S-Strong; M-Medium; L-Low

Course code	21ITE02	E - COMMERCE	L	T	P	C
Core/Elective/Supportive		Elective	3	1	-	4
Pre-requisite		Degree Level - business economics, marketing, Business finance.	Syllabus Version	2021 - 22		

Course Objectives:

The main objectives of this course are to:

1. To understand the three major driving forces behind E-commerce – technology change, business development, and social issues to provide a coherent conceptual framework for understanding the field.
2. To understand the e-business concepts and how it is different from e-commerce.
3. To understand the e-business models and infrastructure.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Demonstrate an understanding of the foundations and importance of E-commerce.	K2
2	Demonstrate an understanding of retailing in E-commerce by analyzing branding and pricing strategies.	K2
3	Using and determining the effectiveness of market research by assessing the effects of disintermediation.	K4
4	Analyze the impact of E-commerce on business models and strategy.	K4
5	Assess the Internet trading relationships including Intra-organizational, Business to Consumer and Business-to-Business.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Anatomy and Framework of E-commerce	9 hours

E-Commerce Framework- E-commerce and Media Convergence – The Anatomy of Ecommerce Applications – E-commerce Organization Applications – Market Forces Influencing the I-Way – Components of I-Way – Network Access Equipment.

Unit:2	E-commerce Applications and Models	9 hours

Architectural Framework for Electronic Commerce – World Wide Web (WWW) Architecture – Web Background: Hypertext Publishing – Technology behind the Web – Security and the web – Consumer-Oriented Applications – Mercantile Models from the Consumer's Perspective – Mercantile Models from the Merchant's Perspective.

Unit:3	Payment System and Privacy Issues	10 hours

E-business - Types of Electronic Payment Systems – Digital Token-Based Electronic Payment Systems – Smart Cards and Electronic Payment Systems – Credit Card-Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems –

Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy Issues –EDI and E-Commerce.		
Unit:4	**Internal Electronic Commerce Systems**	**10 hours**
Internal Information Systems – Macro forces and Internal Commerce – Work-Flow Automation and Coordination – Customization and Internal Commerce – Supply Chain Management (SCM) – Dimensions of Internal Electronic Commerce Systems – Making a Business Case for a Document Library – Types of Digital Documents – Issues behind Document Infrastructure – Corporate Data Warehouses.		
Unit:5	**Marketing Process**	**10 hours**
The New Age of Information-Based Marketing – Advertising on the Internet – Charting the OnLine Marketing Process – Market Research – Search and Resource Discovery Paradigms – Information Search and Retrieval – E-commerce Catalogs or Directories – Information Filtering – Consumer-Data Interface: Emerging Tools.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
Latest trends/developments in E-Commerce industry.		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	Ravi Kalakota, Andrew B.Whinston, “Frontiers of Electronic Commerce” Pearson Education Asia, 1996, Twelfth Impression.
Reference Books	
1	Jeffery F. Rayport, Bernard J.Jaworski , “E-commerce”, Tata McGraw Hill Publication, 2003.
2	Bharat Bhasker, “Electronic Commerce Framework, Technologies and Applications”, Tata McGraw Hill Publication, 2013.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.my-mooc.com/en/mooc/ntuecom/
2	https://www.mooclab.club/tags/e-commerce/
Course Designed By: Dr.M.SUNDARESAN.	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	M	M	L	M	M	M	M	L	L
CO3	L	L	L	M	M	M	L	M	M	S
CO3	S	S	M	S	S	M	M	M	S	L
CO4	M	S	S	M	S	S	M	S	M	M
CO5	M	M	S	S	S	S	M	M	M	S

*S-Strong; M-Medium; L-Low

Course code	21ITE03	MOBILE AD - HOC NETWORKS	L	T	P	C
Core/Elective/Supportive		Elective	3	1	-	4
Pre-requisite		UG –Degree Level: Computer Networks, Wireless Networks, Sensor Networks	Syllabus Version			2021-21

Course Objectives:

The main objectives of this course are to:

1. This course covers all aspects of ad hoc and sensor networking, from design through performance issues to application requirements.
2. This course starts with the design issues and challenges that are associated with implementations of ad hoc and sensor network applications.
3. This course makes students understand the techniques and strategies for localizing sensor nodes in a network by means of exact and relative positioning techniques.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Describe the principles of mobile ad hoc networks & Understand the limitations of Mobile Ad-Hoc Networks.	**K2/K3**
2	Understand types of ad-hoc Routing protocols and it applications	**K2**
3	Evaluate the energy management schemes and Quality of service solution in ad hoc networks.	**K2/K5**
4	Understand WAP Programming& Service model and it Architecture.	**K2**
5	Examine the network security solution and routing mechanism, compare and analyze types of routing protocols used for Unicast and Multicast routing and NS-2 Tools Usage.	**K2/K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction	9 hours

Ad-Hoc Networks- Services and applications - Characteristics - Wireless Sensor Networks -Sensor Application of Body Area Network and Health Care Monitoring - WLANs - WLAN Services - Physical Media For WLANs - Types of Mobile Host Movements - Challenges Facing Ad-Hoc Mobile Networks.

Unit:2	Routing in MANETs	9 hours

Types of Ad-Hoc Routing Protocols- **Proactive Routing Protocols:** DSDV- OLSR - WRP, **Reactive Routing Protocols:** AODV- DSR - TORA- LAR - PAR, **Hybrid Routing Protocols:** ZRP- FSR-LANMAR - Cluster Based Routing Protocols.

Unit:3	QoS and Energy Management	10 hours

Define QoS - Objective of QoS Based Routing - List out the QoS Applications - on Demand QoS Routing Protocol - A Cross Layer QoS of Service Model - Power Management- Advances in Device

Power Management - Advances in Protocol Power Management - Power Conservation by Mobile Applications.		
Unit:4	**Architecture and Model**	**10 hours**
Ad-Hoc Service Location Architectures - Bluetooth Architectures - Bluetooth Network Configuration - Bluetooth Applications - The WAP Protocol Architecture - WAP Service Model - WAP Programming Model - WWW programming Model.		
Unit:5	**Security and NS-2 Tools**	**10 hours**
MANET Performance Metrics, NS2 Simulation parameters - NS2 OTCL - Multicast Routing Mobile Ad-Hoc Networks - Unicast Route Discovery in AODV- Multicast Route Discovery in AODV - Classifications of MAC Protocols - Security in Ad-Hoc Networks.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
Latest Development / Topics in Mobile Ad-Hoc Networks.		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	William Stallings, "Wireless Communications & Networks", Pearson Education, 2005. 2nd edition 2009.
2	C.Siva Ram Murthy, B.S. Manoj, "Ad-Hoc Wireless Networks – Architectures and Protocols", 2nd Edition, Pearson Education, 2011.
Reference Books	
1	Charles E.Perkins , "Ad-Hoc Networking", Pearson Edition , 2011.
2	Fei Hu , Xiaojun Cao, " Wireless Sensor Networks Principles and Practice " CRC Press, 2010.
3	C.K Toh,"Ad-Hoc Mobile Wireless Networks" Protocols and Systems, Pearson Edition, 2011.
4	Carlos de Morais Cordeiro, Dharma Rakish Agrawal, "Ad-Hoc & Sensor Networks", Cambridge Uni.Press, IndiaPvt.Ltd ,2010.
5	George Aggelou," Mobile Ad-Hoc Networks", Tata McGraw –Hill Edition, 2009.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/106/105/106105160/, https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/
2	https://www.it.iitb.ac.in/~sri/talks/manet.pdf
Course Designed By: **Dr.R.VADIVEL.**	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	M	S	M	S	S	L
CO3	S	S	L	M	M	M	M	M	M	S
CO3	M	S	M	S	S	S	M	S	M	M
CO4	S	L	S	L	S	M	M	M	M	L
CO5	M	S	M	M	M	M	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code	21ITE04	INTERNET OF THINGS	L	T	P	C
Core/Elective/Supportive		**Elective**	**2**	**-**	**2**	**4**
Pre-requisite		Basic knowledge of hardware, Programme in C	**Syllabus Version**	**2021-22**		

Course Objectives:

The main objectives of this course are:
1. To gain insight about the architecture and enabling technologies of Internet of Things
2. To understand Arduino micro controller and IDE
3. To develop simple IoT Applications for different domains

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

CO1	To learn the importance of smart objects and smart environment	K1
CO2	To understand and use the microcontroller and various sensors	K2
CO3	To create programs using Arduino IDE and extract data	K3
CO4	To perform WiFi data communications, remote data storage in cloud, and handle the data using web applications	K3,K4
CO5	To identify potential problems and develop solutions using IOT	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	**Introduction to IoT**	**10 -- hours**

Introduction to IOT - Enabling technologies of IOT - AI and Machine Learning - Physical and logical design of IoT - IOT Reference Architecture - IOT Functional Architecture - IoT levels and deployment templates – Application domains of IoT: Home automation – Cities – Environment – Energy – Industry – Agriculture – Transportation - Health care & Lifestyle.

Unit:2	**Basic Electronics for IoT & Arduino IDE**	**20 -- hours**

Understanding basic electronic components and power elements Electric Charge, Resistance, Current and Voltage – Resistors, Capacitors, Diodes, LED, Potentiometer, circuit boards - Analog and digital circuits – Microcontrollers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation
Arduino IDE: Installation and Set-up - Programming Fundamentals with C using Arduino IDE Program Structure in C - Basic Syntax - Data Types / Variables / Constants - Operators, Conditional Statements and Loops - Using Arduino C Library functions for Serial, delay and other invoking functions.

Unit:3	**Arduino Microcontroller and sensor**	**20 -- hours**

Working with Arduino: LED and Switch - Data acquisition with IOT Devices - Understanding Sensors and Devices - Understanding the Inputs from Sensors - Working with Temperature Sensors -Working with Ultrasound Sensor -Working with humidity sensor - Working with Motion Sensor - Working with IR Sensor - Working with Proximity Sensor - Working with Accelerometer and vibration sensor.

Unit:4	**Medical Sensors and Actuators**	**20 hours**
Understanding Medical Sensors: Flow Sensor - Optical Sensor - Body Temperature Sensor - Blood Pressure Sensor -Airflow sensor (breathing) - Patient position sensor (accelerometer) - Page 27 of 111 Master of Computer Application 2020-21 onwards - UD - Annexure No.55A1 SCAA DATED: 23.09.2020 Pulse and oxygen in blood sensor (SPO2) - Galvanic skin response (GSR - sweating) sensor. Understanding the Outputs through Actuators - Activating LED Lights - Activating Relay - Activating Buzzer - Running DC Motors - Running Stepper Motors and Servo Motors.		
Unit:5	**Data Communication from IOT devices**	**20 hours**
Building and Using Communication Devices to transfer data from IOT Devices - Understanding the Communication Principles to Transfer the data from IOT Devices; Using WIFI to Transfer the data from IOT Sensor; Programming Fundamentals with Web Applications for handling Data Communication from IOT Device; Remote Communication to cloud/external application .		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**92 hours**

Text Book(s)

1	ArshdeepBahga, Vijay Madisetti, _Internet of Things: A Hands-On Approach‘, Universities Press, 2015.
2	Boris Adryan, Dominik Obermaier, Paul Fremantle, ‘The Technical Foundations of IoT’, Artech Houser Publishers, 2017.
3	Michael Margolis, “Arduino Cookbook” 2nd Edition, O'Reilly Media, 2012.
4	Marco Schwartz, ‘Internet of Things with ESP8266’, Packt Publishing, 2016

Reference Books

1	Charles Platt, “Make Electronics – Learning by discovery”, O'Reilly Media, 2015.
2	Michael Miller, “ The Internet of Things,” Pearson India, 2015.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Introduction to IOT,,https://nptel.ac.in/courses/106/105/106105166/

Course Designed By: Mr. T.RAMESH.

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	M	M	S	S	S	S	M	L	L
CO3	L	M	M	S	S	S	S	M	L	L
CO3	M	M	S	S	S	S	S	S	L	M
CO4	S	M	S	S	S	S	S	S	L	S
CO5	S	M	S	S	S	S	S	S	L	S

*S-Strong; M-Medium; L-Low

Course code	21ITE05	CYBER SECURITY	L	T	P	C
Core/Elective/Supportive		Elective	3	1	-	4
Pre-requisite		UG- Degree Level: Computer Networks, LAN, WiFi- Email- Security, Cyber Crime, Website Hacker, Anti-virus, Smart/Android Phone Security.	Syllabus Version		2021-22	

Course Objectives:

The main objectives of this course are to:

1. To understand the fundamental functioning of Cyber security.
2. To understand the different protective mechanism in varied Cyber space.
3. To develop graduates that can identify, analyze, and remediate computer **security** breaches.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basics of Cyber security.	**K2**
2	Apply the appropriate security over internet and mobile devices.	**K3**
3	Understand the legal frame work of Cyber security and different security threats.	**K2**
4	Analyze and adopt the required firewall and security details.	**K4**
5	Examine the method and procedure for cryptography and apply it.	**K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Cyber Security	9 hours

History of Internet - Overview of Cyber Security - The Security Environment - **Threats:** Cyber Crime, Warfare, terrorism and Espionage. **Vulnerabilities:** vulnerabilities in software, System administration, Network Architectures, Open Access Data, Weak Authentication.

Unit:2	Browser security	9 hours

Cyber space - web browsing and browser security - Email security, firewall in browsers, security certificate - basic security for HTTP applications and services. Password security - guidelines to choose a password - Two steps authentication -WiFi security. Securing social media - social media secure networking - smart phone security-Android, IoS.

Unit:3	Cyber Intrusion and Detection	10 hours

Cyber Intrusion, Abuse of Privileges, Unauthorized Access, Malware infection, Intrusion detection and Prevention Techniques: Network based and host based Anti-Malware software. Cyber Security Regulations - Government and Private organizations in Cyberspace - Cyber Security Standards - National Cyber Security Policy 2013.

Unit:4	**CRYPTOGRAPHY**	**10 hours**
Introduction to Cryptography, **Classifications of Cryptography:** Symmetric key and Asymmetric key Cryptography, Applications of Cryptography. Firewalls - Types of Firewalls, VPN Security - **Security Protocols:** Application Layer security - PGP and S/MIME, Transport Layer security – SSL and TLS, Network Layer Security -IPSec.		
Unit:5	**Cyber Awareness**	**10 hours**
Introduction to Cyber Forensics, Preliminary Investigations procedure and methods, Conducting disk-based analysis, Tracing Internet access, Tracing memory. Recovering from Information Loss - Destroying Sensitive Information - Cleaner for Windows - Defensive Programming - Emerging Cyber Security Threats.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
Latest Development/ Update Topics in Cyber Security, Anti-Virus, Intrusion detection and Prevention Techniques.		
	Total Lecture hours	**50 hours**

Text Book(s)	
1	Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, 4th Edition, Vikas Publishing House, 2011.
2	Atul Kahate, “Cryptography and Network Security”, McGraw Hill, 2013.
Reference Books	
1	William Stallings, “Cryptography and Network Security Principles and Practices”,7th Edition, Pearson, 2017.
2	Man Young Rhee, “Internet Security: Cryptographic Principles”, Wiley Publications, 2003.
3	Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2008.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://swayam.gov.in/nd2_nou19_cs08/preview, https://swayam.gov.in/nd2_cec20_cs15/preview
2	https://nptel.ac.in/courses/106/105/106105031/

Course Designed By: **Dr.R.VADIVEL.**

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	M	S	L	S	S	S
CO3	S	S	S	M	M	M	L	L	M	S
CO3	S	S	L	S	M	S	L	S	M	M
CO4	M	M	S	M	S	M	L	M	L	S
CO5	S	M	S	M	L	M	L	S	M	M

*S-Strong; M-Medium; L-Low

Course code	21ITE06	ROBOTICS AND AUTOMATION	L	T	P	C
Core/Elective/Supportive		Elective	3	1	-	4
Pre-requisite		Basics about the Automation	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. Students can understand the concept of Automation
2. Students can familiar with the concept of Robotics, MicroRobotics Humanoid Robotics and Industrial Robotics
3. Students can contribute their own design and development of Industrial Robotics

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concept of Automation	K2
2	Redesign the existing Automation system in the Industry	K3
3	Understand the working principles of Robotics, MicroRobotics and Industrial Robotics	K2
4	Understand the Merits, Demerits and Challenges of designing a Robotics system	K5
5	Contribute to design and develop new Robotics system	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction to Robotics	9 -- hours

History of Robotics - Classification of Robotics - Industrial Automation
Theory of Machines and Mechanisms : Popular Mechanisms - Gear and Gear Trains Synthesis of Mechanisms - Kinematic Analysis of Mechanisms - Practical Guide to use Various Mechanisms - Introduction to Electronics : Basic Elements - Sensor Design - Using the Parallel and Serial Port of the Computer - Microcontroller - Actuators
.

Unit:2	Kinematics of Robotic Manipulator and Sensors in Robotics	10 -- hours

Introduction - Position and Orientation - Frames - Forward Kinematics - Links and Joints - Notations - Kinematic Modeling - Manipulator - Geometric Solution - Systematic Solution
Sensors in Robotics **:** Classification of Sensors - Encoders and Dead Reckoning - Infrared Sensors - Ground-Based RF Systems - Active Beacons - Ultrasonic Transponder - Trilatertion - Acceleretometers - Gyroscopes - Gyros - Laser Range-Finder - Vision Based Sensors - Color-Tracking Sensors - Sensor Mounting Arrangement Design of the Circuitry - Reading the Pulses in a Computer

Unit:3	**Wheeled Mobile Robot and Legged Robots**	**10 -- hours**
Introduction - Classification - Kinematics and Mathematical Modeling - Control of WMR - Identification and Elimination of the Problem - Kinematics of Robotic Manipulator – Legged Robots - Balance of Legged Robots - Analysis of Gaits in Legged Animals - Kinematics of Leg Design		
Unit:4	**Introduction to MicroRobotics and Humanoid Robotics**	**10 -- hours**
MicroRobotics : Introduction - Size and Fabrication Technology - Mobility and Functional for MEMS based micro-robots - Arrayed actuator - principles - actuators - Micro-conveyors - Walking MEMS Micro-robots – Micro-robot powering - Micro-robot communication - Micro-fabrication principles - Design selection criteria for micromachining - Packaging and Integration aspects – Micro-assembly platforms and manipulators Humanoid Robotics : Characteristics – Kinematics of Humanoid robotics – Dynamics of Humanoid Robotics – 2D walking pattern and Whole Body motion		
Unit:5	**Industrial Applications and Case Studies**	**9 -- hours**
Robot Applicator – Industrial Application – Material Handling – Processing Application – Assembly Application – Inspection Application – Principles of Robot application and play Case studies : Automation in automobile Industries – Textile Industries – Mechanical Industries – Humanoid Robotics		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**50 -- hours**

Text Book(s)

1	Frank Chongwoo Park and Kevin M. Lynch, Modern Robotics: Mechanics, Planning, and Control, , Cambridge University Press, 2017.
2	Yves Bellouard, “Microrobotics Methods and Applications”, CRC Press, Massachusetts, 2011
3	Kajita**, S.,** Hirukawa**,** H., Harada**,** K**.,** Yokoi**,** K**.,** Introduction to Humanoid Robotics, **,** Springer, 2014.
4	Appin Knowledge Solutions, Robotics, Hangham, Massachusetts, New Delhi, Infinity Science Press LLc, 2007.

Reference Books	
1	David Cook, Robot Building for Beginners, Apress Media LLC, 2002.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://swayam.gov.in/nd1_noc19_me74/preview
2	https://nptel.ac.in/courses/107/106/107106090/
3	https://nptel.ac.in/courses/112/101/112101099/
Course Designed By: Mr. T.RAMESH.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	S	L	M	S	M	S	L	L
CO3	M	M	S	L	M	S	M	S	L	S
CO3	M	M	S	L	M	S	M	S	L	M
CO4	M	M	S	L	M	S	M	S	L	L
CO5	M	M	S	L	M	S	M	S	L	S

*S-Strong; M-Medium; L-Low

Course code	21ITE07	OBJECT ORIENTED SOFTWARE ENGINEERING	L	T	P	C
Core/Elective/Supportive		Elective	3	1	-	4
Pre-requisite		Software Engineering	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. This course aims at introducing to the students about the product that is to be engineered and the process that provides a framework for the engineering technology.
2. The course facilitates the students to analyse risk in software design and quality and to plan, design, develop and validate the software project.
3. It also improves the knowledge of the students to do research in further developments.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Explain a process model for a software project Development.	K1
2	Prepare the SRS, Design document, Project plan of a given software system	K6
3	Apply Project Management and Requirement analysis, Principles to S/W Project development.	K3
4	Analyse the cost estimate and problem complexity using various Estimation techniques	K4
5	Explain software configuration process.	K1

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

UNIT:1	SOFTWARE PROCESS AND LIFE CYCLE MODELS	9 HOURS

Software Development in Theory - Waterfall Life-Cycle Model - Rapid-Prototyping Life-Cycle Model - Open-Source Life-Cycle Model - Spiral Life-Cycle Model - Agile Processes - The Software Process - Improving the Software Process - Capability Maturity Models - Other Software Process Improvement Initiatives - Costs and Benefits of Software Process Improvement.

UNIT:2	PLANNING AND ESTIMATION	9 HOURS

Planning and Estimating - Planning and the Software Process - Estimating Duration and Cost - Intermediate COCOMO - COCOMO II - Estimation Issues - Components of a Software Project Management Plan - Software Project Management Plan Framework - Planning Testing - Training Requirements - Documentation Standards - Testing the Software Project Management Plan.

UNIT:3	WORKFLOW OF SOFTWARE LIFE CYCLE	10 HOURS

The Requirements Workflow - Overview of the Requirements Workflow - The Business

Model - Initial Requirements - Metrics for the Requirements Workflow - Challenges of the Requirements Workflow - The Analysis Workflow - Extracting the Entity Classes - Challenges of the Analysis Workflow - The Design Workflow - Object-Oriented Design - Formal Techniques for Detailed Design - Metrics for Design - Challenges of the Design Workflow.		
UNIT:4	**IMPLEMENTATION WORKFLOW**	**10 HOURS**
The Implementation Workflow - Choice of Programming Language - Good Programming Practice - Coding Standards - Test Case Selection - Black-Box Unit-Testing Techniques - Comparison of Unit-Testing Techniques - Integration Testing - Product Testing - Acceptance Testing - Metrics for the Implementation Workflow - Challenges of the Implementation Workflow.		
UNIT:5	**SOFTWARE CONFIGURATION MANAGEMENT**	**10 HOURS**
Software Configuration Management - Software Configuration Items - The SCM Process - Identification of Objects in the Software Configuration - Version Control - Object Pool Representation of Components, Variants, and Versions - Change Control - The Change Control Process - Access and Synchronization Control - Configuration Audit - Status Reporting - SCM Standards.		
UNIT:6	**CONTEMPORARY ISSUES**	**2 HOURS**
Expert Lectures, Online Seminars – Webinars		
	TOTAL LECTURE HOURS	**50 HOURS**

Text Book(s)

1	Bernd Bruegge, “Object oriented software engineering”, Second Edition, Pearson Education.

Reference Books

1	Stephan R. Schach, “Object Oriented Software Engineering”, Tata McGraw Hill, 2008.
2	Roger Pressman, “Software Engineering”, sixth edition, Tata McGraw Hill, 2014.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Software Engineering, Prof. Rajib Mall, Dept of CSE, IIT Kharagpur.
2	

Course Designed By: Dr. E. BOOPATHI KUMAR.

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	M	S	S	M	S	S
CO3	S	S	S	S	S	S	S	L	S	M
CO3	S	S	S	S	S	S	S	M	M	M
CO4	S	S	M	S	S	S	S	L	M	S
CO5	M	L	L	L	L	S	S	L	S	S

*S-Strong; M-Medium; L-Low

Course code	21ITE08	OPEN SOURCE TECHNOLOGY	L	T	P	C
Core/Elective/Supportive		Elective	2	1	2	4
Pre-requisite		Knowledge about Operating System, Internet and Web Programming	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. Students are able to learn fundamentals of open source operating system
2. Students are able to learn open source Desktop environment
3. Develop their own open source software using these tools

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Familiar with open source Operating System	K2
2	Familiar with open source software tools and package	K2
3	Design their own software package using open source software	K3
4	Get a job with their own open source software development skills	K6
5	Contribute the open software community	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	FOSS	8 -- hours

Open Source - Definition – Terms - Technology – Need - Free and Open Source Software (FOSS) Open Source Software Licenses.

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Unit:2	Linux	10 -- hours

Linux Kernel -Architecture - Internal representation of files -Inodes –Structure of a regular file – Directories – shell - Basic commands - Desktop environment –KDE –GNOME -Development environment tools and systems

Unit:3	Perl	10 -- hours

Overview of Perl – Variables – Statements - Scalar values - Operators - Control structures – regular expressions – Arrays – Hashes – List processing - Pattern Matching – File Handling

Unit:4	**PHP**	**10 -- hours**
Basic Syntax of PHP – web environment - Common PHP Script - Elements -Using Variables - Constants – Data types - Operators - Statements – Flow Control functions – Dates and Times - Working With Arrays - Using Functions - String Manipulation and Regular Expression - File and Directory Handling - Working With Forms - OOP		
Unit:5	**MySQL**	**10 -- hours**
Data Types -Primary Keys and Auto Increment Fields – Queries - SQL programs - Create Database and Tables – ODBC - Connecting to MySQL with PHP - Creating, opening and Closing a Connection - Inserting data with PHP - Retrieving data with PHP.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**50 -- hours**

Text Book(s)

1	Chris DiBona, Danese Cooper and Mark stone,"Open Sources 2.0 The Continuing Evolution", First Edition, O"Reilly, 2005.
2	James K L, "Linux : Learning the Essentials", PHI Learning Private Ltd., 2012
	Larry Wall, Tom Christiansen, Jon Orwart, "Programming PERL" , Third Edition, O"Reilly, 2010.
3	Elliot White III, Jonathan D.Eisenhamer, "PHP 5 in practice" Pearson Education, 2007.
4	Mark Lutz, " Programming Python 4E" , O"Reilly, 2011.
5	Paul Du Bois, O"Reilly Publishers," My SQL Cookbook", Second Edition, 2010.

Reference Books

1	James Lee and Brent Ware , Open Source Web Development with LAMP : Using Linux, Apache, MySQL, Perl, and PHP, , Addison-Wesley Professional, 2002
2	Martin C. Brown, The Complete Reference Python, ,Mc Graw Hill, 2018

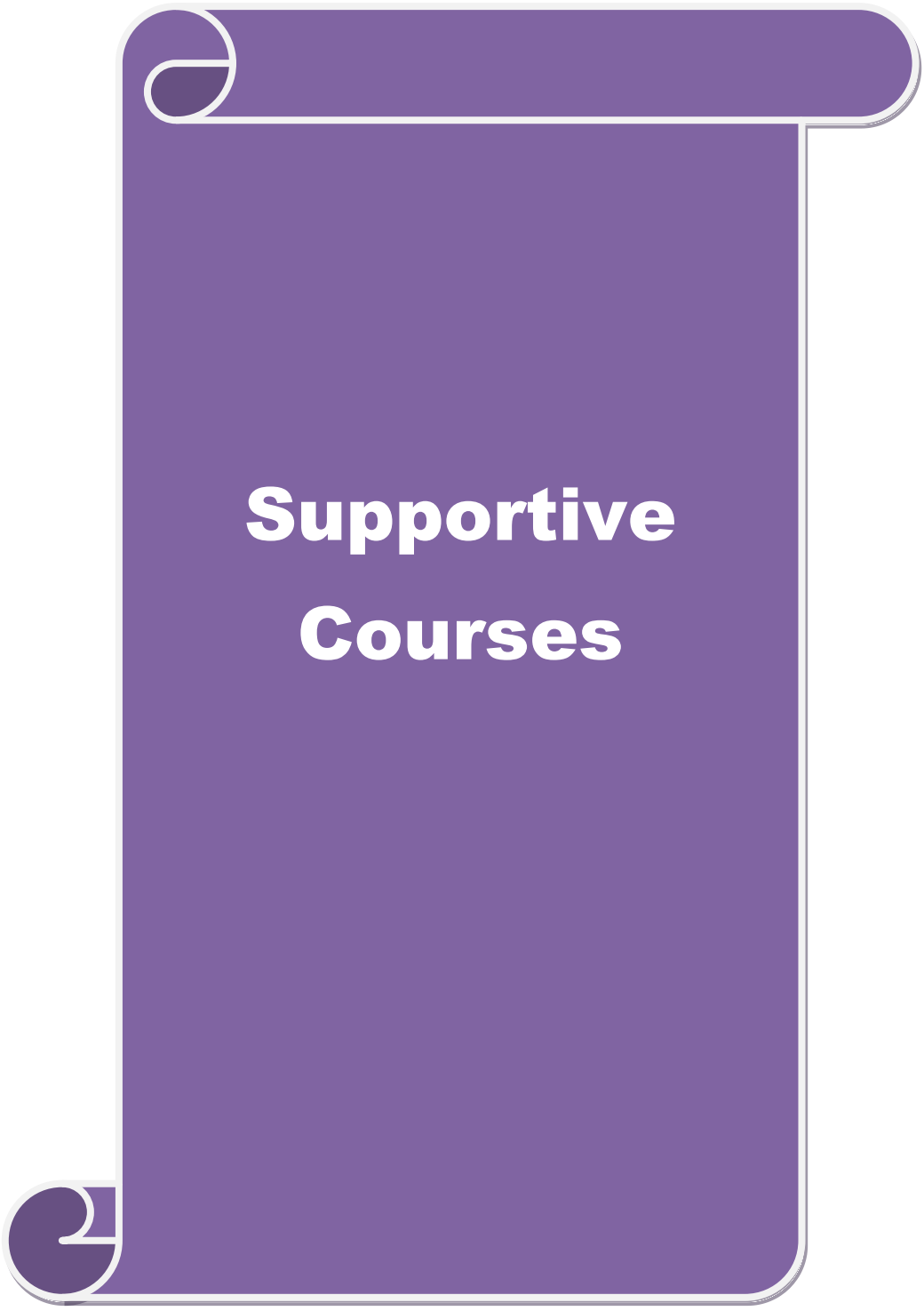
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://swayam.gov.in/nd2_aic20_sp24/preview
2	https://swayam.gov.in/nd2_aic20_sp31/preview
3	https://swayam.gov.in/nd2_aic20_sp32/preview
4	https://swayam.gov.in/nd1_noc19_cs41/preview

Course Designed By: Mr. T.RAMESH.

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	M	S	S	S	S	S	S	S	L
CO3	L	M	S	S	S	S	S	S	S	L
CO3	L	M	S	S	S	S	S	S	S	M
CO4	L	M	S	S	S	S	S	S	S	S
CO5	L	M	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low


Supportive
Courses

Course code	21ITS01	INTRODUCTION TO INDUSTRY 4.0	L	T	P	C
Core/Elective/Supportive		Supportive	2	-	-	2
Pre-requisite		Big Data, Artificial Intelligence	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. At the end of completing this course, students will have knowledge on Industry 4.0,
2. Need for digital transformation and the following Industry 4.0 tools:

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the need of Industry 4.0.	K2
2	Analyse the usage of Artificial Intelligence.	K4
3	Understand the Evolution of Big Data.	K2
4	Implement various applications in Big Data.	K5
5	Analyse the tools to perform Analytics.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

UNIT:1	INDUSTRY 4.0	4 HOURS

Need – Reason for Adopting Industry 4.0 - Definition – Goals and Design Principles - Technologies of Industry 4.0 – Big Data – Artificial Intelligence (AI).

UNIT:2	ARTIFICIAL INTELLIGENCE	5 HOURS

Artificial Intelligence: Artificial Intelligence (AI) – What & Why? - History of AI - Foundations of AI -The AI - Environment - Societal Influences of AI – Application Domains and Tools

UNIT:3	INTRODUCTION TO BIG DATA	5 HOURS

Evolution - Data Evolution - Data : Terminologies - Big Data Definitions - Essential of Big Data in Industry 4.0 - Big Data Merits and Advantages - Big Data Components : Big Data Characteristics - Big Data Processing Frameworks

UNIT:4	BIG DATA APPLICATIONS	5 HOURS

Big Data Applications - Big Data Tools - Big Data Domain Stack : Big Data in Data Science – Big Data in IoT - Big Data in Machine Learning - Big Data in Databases - Big Data for Industry -Big Data Roles and Skills -Big Data Roles - Learning Platforms

UNIT:5	APPLICATIONS AND TOOLS OF INDUSTRY 4.0	5 HOURS
Applications Of IoT – Manufacturing – Healthcare – Education – Aerospace and Defense –Agriculture – Transportation and Logistics – Impact of Industry 4.0 on Society: Impact on Business, Government, People.		
UNIT:6	**CONTEMPORARY ISSUES**	**2 HOURS**
Expert Lectures, Online Seminars – Webinars		
	TOTAL LECTURE HOURS	**26 HOURS**

Text Book(s)

1	P. Kaliraj, T. Devi, Higher Education for Industry 4.0 and Transformation to Education 5.0, 2020

Reference Books

1	V. Bhuvaneswari, T. Devi, "Big Data Analytics: Scitech Publisher , 2018

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Introduction to Industry 4.0 and Industrial Internet of Things, Prof. Sudip Misra, Dept of CSE, IIT, Kharagpur.
2	Introduction to Big Data, Dr. Rajiv Misra, Dept of CSE, IIT, Patna.
3	Artificial Intelligence, Deepak Khemani, Dept of CSE, IIT, Madras.

Course Designed By: Dr. E. BOOPATHI KUMAR.

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	S	L	M	S	L
CO3	S	S	S	L	M	S	M	S	S	M
CO3	S	M	S	S	L	S	S	S	S	L
CO4	M	L	M	S	S	M	S	L	M	M
CO5	L	S	L	S	S	L	S	M	L	L

*S-Strong; M-Medium; L-Low

Course code	21ITS02	WINDOWS AND OFFICE AUTOMATION	L	T	P	C
Core/Elective/Supportive		Supportive	2	-	-	2
Pre-requisite		Computer Basics	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To introduce about windows10 environment, browse internet and manage files.
2. To learn about the basics of Windows 2016 and Office word 2016.
3. To know about Excel 2016 to maintain business and financial accounts.
4. To enable students to practice with PowerPoint 2016 and create presentations.
5. To provide a clear view of office outlook and organize the contents.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Describe the usage of computers, its operating systems and why computers are Essential components in business and society.	K2
2	Utilize the Internet Web resources and evaluate on-line e-business system.	K2
3	Solve common business problems using appropriate Information Technology applications and systems.	K5
4	Identify categories of programs, system software and applications. Organize and work with files and folders.	K2
5	Understand Microsoft office	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

UNIT:1	THE WINDOWS 10 ENVIRONMENT	4 HOURS

Getting Started, Personalizing Folders and Files, Working With Applications, Notifications, Browsing, Manage Peripheral Devices, Network.

UNIT:2	OFFICE 2016 PACKAGE	6 HOURS

User Interface, Change Office, Application Options, Create Files, Open and Move Files, View, Edit Files, Save and Close. Word 2016: Modify the Text, Collaborate Documents, Merge Data With Documents and Labels.

UNIT:3	EXCEL 2016	4 HOURS

Data Calculations, Naming Data, Excel Tables, Formulas, Worksheet Data, Manipulate Worksheet Data, Valid Sets of Values.

UNIT:4	POWERPOINT 2016	4 HOURS

Slides, Add and Remove Slides, Divide, Rearrange, Apply Themes, Slide Backgrounds,

Simple Graphics, Insert, Move, and Resize Pictures, Pictures, Shapes, Sound, Animate Text and Pictures.		
UNIT:5	**OUTLOOK 2016**	**6 HOURS**
Email Messages, Attach Files, Display Messages, Participant Information, Respond to Messages, Conversations, Folders.		
UNIT:6	**CONTEMPORARY ISSUES**	**2 HOURS**
Expert Lectures, Online Seminars – Webinars		
	TOTAL LECTURE HOURS	**26 HOURS**

Text Book(s)

1	Windows 10 Step by Step, Joan Lambert Steve Lambert, 2015.

Reference Books

1	
	Microsoft Office 2016 Step by Step, Joan Lambert Curtis Frye, 2015.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Introduction to Office Automation, R. Rajagopalan, Principal, Speed Star Technical Institute.

Course Designed By: Dr. E. BOOPATHI KUMAR.

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	S	M	M	S	S
CO3	S	L	S	M	L	S	M	S	S	S
CO3	S	M	S	S	S	S	S	S	S	S
CO4	M	L	S	M	L	S	S	S	M	L
CO5	L	M	S	S	S	S	S	L	S	L

*S-Strong; M-Medium; L-Low

Course code	21ITS03	BASICS OF INTERNET	L	T	P	C
Core/Elective/Supportive		Supportive	2			2
Pre-requisite		General Knowledge - Computer, Laptop/ Smart phone, Internet, Web Browser.	Syllabus Version			2021-22

Course Objectives:

The main objectives of this course are to:

1. Non-Computer Students are Able to understand the Fundamentals of Computer Field and IT Sector, Social Media.
2. This course aims at facilitating the student to understand the basic internet programming concepts
3. It gives guidance for Browsing World Wide Web and the Internet Applications, Easy to Content Searching Techniques.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Apply a structured approach to identifying needs, interests, and functionality of a website and Internet.	**K2/K3**
2	Browse websites that meet specified needs and interests, Contact through Mail and it Benefits.	**K1**
3	Understand Web Browser usage and it Example of Web Browsers.	**K2/K3**
4	Gain the Knowledge in Search Engines like Google Search, Yahoo, MSN and Ask.	**K2/K3**
5	Well-versed in Social Networks and Social media.	**K2/K3**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Introduction to the Internet	4 hours

Introduction - What Is a Computer – Supercomputers - Computer Programs - Computer Programmers - Computer Organization - Input unit - Output unit - Memory unit - Memory or Primary memory - Central processing unit (CPU).

Unit:2	World Wide Web	5 hours

History of the Internet and World Wide Web - ARPANET - Internet - Electronic mail - Internet Protocol - Bandwidth - Hypertext Markup Language - World Wide Web Consortium (W3C) - Distributed and Client/Server Computing.

Unit:3	Web Browser Basics	5 hours

Introduction to the Internet Explorer 7 and Firefox 2 Web Browsers - Internet Explorer 7 and Firefox 2 Features - Connecting to the Internet - Network Interface card (NIC) - local area network (LAN) - Digital Subscriber Line (DSL) - Internet Service Provider (ISP) - URL (Uniform Resource Locator) - Customizing Browser Settings.

Unit:4	**Searching the Internet**	**5 hours**
Search engines - Options in Firefox 2 - Databases - Meta search engines - Searching the Internet with Internet Explorer 7 - Keeping Track of Your Favorite Sites - Bookmarks - Restricted access - Uploading - Online Help - Internet Explorer 7 Help dialog - Firefox 2 Help dialog - Contents and Index - Other Web Browsers - Opera - Safari.		
Unit:5	**Web 2.0**	**5 hours**
Web 2.0 Introduction - Web 1.0 - Search engine results page (SERP) - Google Search- Yahoo - MSN - Ask - Vertical Search - Location Based Search - Social Networking - Social Media - Social Bookmarking .		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
Recent Trends & Updated Technologies in Internet/Social Media.		
	Total Lecture hours	**26 hours**

Text Book(s)	
1	Internet & World Wide Web HOW TO PROGRAM, 5e, P. J. Deitel and H. M. Deitel, 2012.
2	Basic Internet Skills (Babani computer books), James Gatenby , September 2001.
Reference Books	
1	Internet Book, The: Everything You Need to Know About Computer Networking and How the Internet Works by Douglas E. Comer (1997-04-22).
2	Internet and Web Technologies, Raj Kamal, Tata MC- Graw HILL.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/106/105/106105084/, https://www.youtube.com/watch?v=vXiHisrS90E
2	https://www.youtube.com/watch?v=YOXwcbwSEUo, https://www.youtube.com/watch?v=s2S2DuE2VxA
Course Designed By: **Dr.R.VADIVEL.**	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	L	S	M	M
CO3	M	M	M	S	M	M	L	L	S	L
CO3	S	S	M	S	S	S	L	S	M	M
CO4	S	M	S	L	S	M	L	M	L	M
CO5	S	L	M	L	M	L	L	S	M	M

*S-Strong; M-Medium; L-Low

Course code	21ITS04	INTRODUCTION TO INFORMATION TECHNOLOGY	L	T	P	C
Core/Elective/Supportive		Supportive	2			2
Pre-requisite		Basic Knowledge of Computers	Syllabus Version	2021-22		

Course Objectives:

The main objectives of this course are to:

1. Non-Computer Students are Able to understand the Fundamentals of Computer Science
2. Students are able to understand the basics of RDBMS and Networking
3. To assist the Students those who are appearing for the Government Examinations like Bank, LIC , Railways

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the computer fundamentals	K2
2	Prepare for government exam easily	K3
3	Helpful for further studies in computer science	K3
4	Get a job in a small office	K6
5	Setup own Data entry store	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Computer Basics	4 -- hours

Basic Computer Terminology - History Of Computers - Number System – ASCII - ISCII - UNICODE; .

Unit:2	Microprocessor and Memory	5 -- hours

Microprocessor : Basic Concepts - Clock Speed – Types; - Components Of Computer Systems - ALU – Input /Output Devices – Ports/ Connectors

Memory Concepts : Units − Primary Memory - Secondary Memory

Unit:3	Operating System and Software	5 -- hours

Operating System : Need - Functions - Concept Of Booting - Operating System Basics

Software Concepts : Types of Software - System Software - Utility Software - Application Software - System Software vs - Operating System – Complier - Interpreter and Assembler

Unit:4	**Introduction to RDBMS**	**5 -- hours**
Introduction To RDBMS – File Organization – Normal Form – DDL And DML – Schema - Indexing – Sorting – View		
Unit:5	**Introduction to Computer Networks**	**5 -- hours**
Computer Network Basics – Protocol – Topology - Networking Devices Virus, Hacking Internet/Intranet/Extranet – WWW – Web Server – Browser – Search Engine – Home Page		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**26 -- hours**

Text Book(s)	
1	SushilaMadhan, Information Technology, Taxmann.2015
2	Introduction to Information Technology, ITL limited, Pearson education, 2015
Reference Books	
1	Richord Fox, Information Technology, Chapman and Hall, 2015
2	S.K. Das, Fundamentals Of Computer Science, Platinum Publishers, 2012.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://swayam.gov.in/nd2_cec19_cs06/preview
Course Designed By: Mr. T.RAMESH.	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	S	L	M	M	M	M	S	S	S
CO3	L	M	L	M	S	M	S	M	S	S
CO3	L	S	L	S	S	S	S	S	S	S
CO4	L	M	L	M	S	S	S	S	M	M
CO5	L	M	L	M	S	S	S	S	M	M

*S-Strong; M-Medium; L-Low

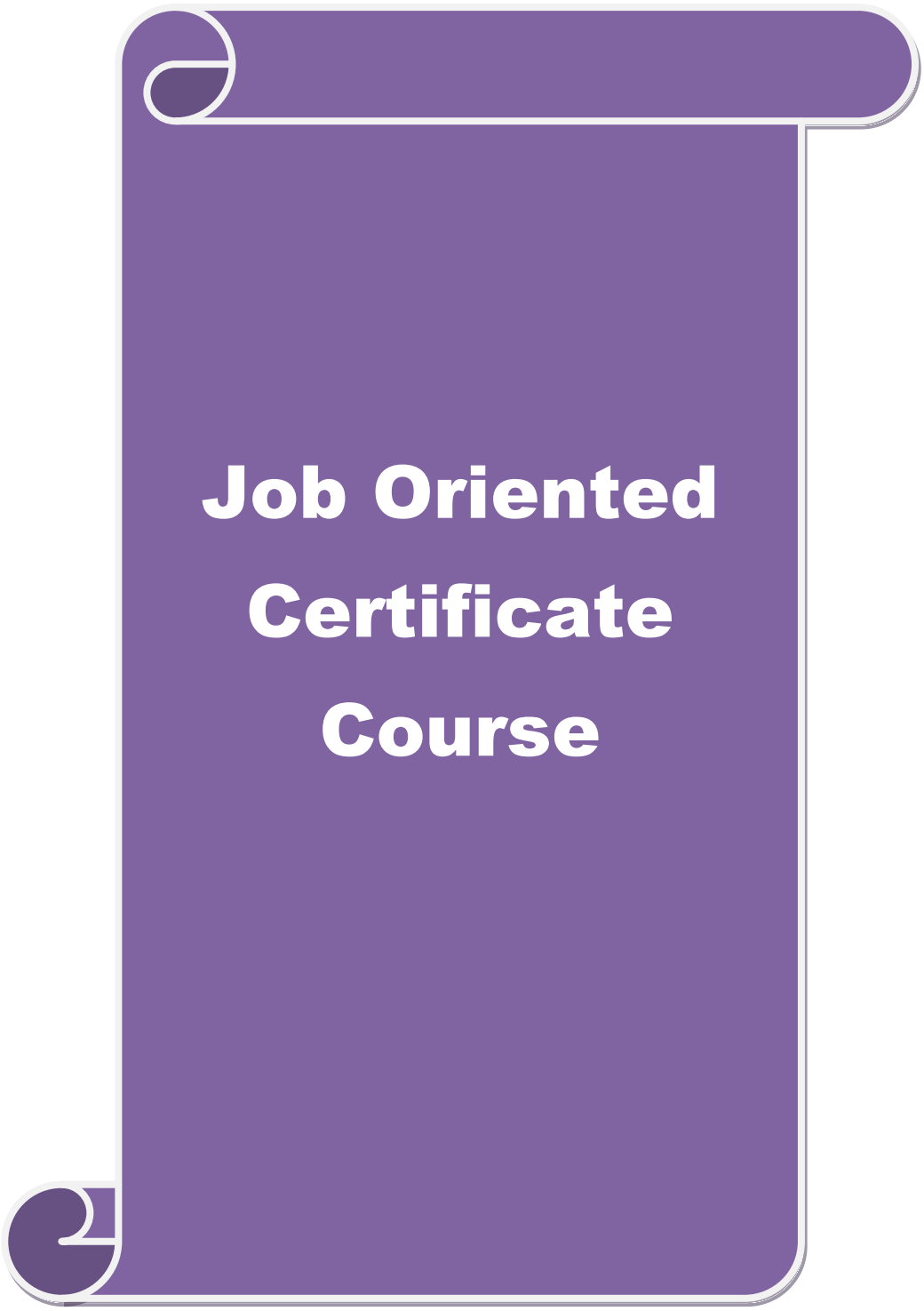
Value Added Courses

VALUE ADDED CERTIFICATE COURSE : Certificate Course in Linux System Administration		
Name of the Department	Information Technology	
Name of the Faculty Member i/c With Complete Address with Phone and email	Mr.T.Ramesh Associate Professor Department of Information Technology Bharathiar University Coimbatore – 641 046 Phone : 98945 11879 e-mail : trcsebu@gmail.com	
Inter / Intra Department Course	Inter Department Course	
Duration of the Course	40 Hours	
Eligibility	UG/PG in IT/CA/CS	
Number of Candidates to be Admitted	30	
Mode of the Course	Regular	
Collaboration if any with Companies .	Yes. Yet to finalise the company	
Registration Procedure	First Come First Serve	
Job Opportunities:		
System Administrator in the Software Industry		
Freelance System Administrator		
The objectives of the Course are :		
The main objectives of this course are to:		
1	To understand and manage the Linux OS	
2	To install and manage software and packages and User Administration	
3	To Configure networks relates tools and backups	
4.	To Configure RAID and LVM - hard disk tools	
5.	To become the system and network administrator	
Course Content	Lecture and Practical	
Module 1	**Linux Basics**	4 -- hours
	Introduction to Unix & Linux - History of Unix & Linux - Basic Concepts of Operating Systems, Kernel, shell and file system structure - Basic Concepts of Linux -Basic Commands of Linux – Advanced Linux Commands	
Module 2		4 -- hours
	Installation of Linux - Interactive Installation - Kickstart Installation - Network based Installation - Startup and Shutdown scripts - Boot Sequence - Kernel Initialization - INIT Process	
Module 3	Software and Package Administration	3 -- hours
	Software Package Administration - Installing and deleting software packages - Querying and updating software packages	

Module 4	**User Administration**	5 --hours
	User and group administration - Creating and deleting users from the system - Modifying users profile - Creating and deleting groups - Important system files related to user administration Advanced file permissions (ACL) - Assigning advanced files permissions i.e. SUID, SGID and Sticky – bit - Creating, modifying and deleting ACL's	
Module 5	**DNS and DHCP Configuration**	4 --hours
	DNS with Bind - Basis of Internet - Basic of DNS and BIND - Configuring DNS primary server, and secondary servers - Configuring DNS for multiple domains and sub domains - Configuring various clients (Windows & Linux) Dynamic Host Configuration Protocol (DHCP) - Configuring Linux as DHCP server - Configuring various clients for dhcp server (Windows & Linux)	
Module 6	**NFS and NIS Configuration**	4 --hours
	NFS - Configuring NFS server - Mounting NFS exports on NFS clients Network Information Service (NIS) - Basics of NIS- Configuring NIS master server, slave server and client - Creating NIS users	
Module 7	**Web/FTP/Mail Servers Configuration**	4 -- hours
	Web Server (Apache) - Basics of web service -Introduction to Apache - Configuring Apache for main site - Configuring Apache for multiple sites using IP-based, port-based and name-based virtual hosting FTP server (vsftp daemon) - Basics of File Transfer protocol - Configuring proftpd for anonymous ftp service Mail Server(SMTP,POP3,IMAP) - Basics of Mail servers - Configuring SMTP services - Configuring POP3/IMAP service on Linux - Integrating Antivirus and Antispam.	
Module 8	**Proxy Server and Connecting to Windows**	3 -- hours
	Proxy Server (Squid) - Basics of proxy services - Configuring proxy services - Creating ACL's for controlling access to internet Samba service- Basics of file sharing in Windows -Configuring samba to act as member server for Windows Network - Configuring samba service for file sharing with windows systems	
Module 9	**RAID Implementation**	5 --hours
	RAID (Redundant Array of Inexpensive Disks) - Implementing RAID on Linux - Pre installation / Post Installation - RAID levels (0, 1, and 5) configuration using RAID tools.	

	Disk Partitioning and Mounting File System - Using fdisk, disk druid utilities for disk partitioning - Using mkfs, dd commands to create file systems - Mounting various file systems -Auto mounting of file system Logical Volume Manager (LVM) - Quotas -Enabling Quotas on partitions -Creating Quotas for users - Auditing quotas - Backup and recovery - Introduction to various types of backup media - Backup and restoring data using dump / restore commands - Backup and restoring using tar and cpio commands - Automation of Jobs	
Module 10	**Security Administration**	3 – hours
	Securing your Linux Server - Implementing local security - Implementing network security - Implementing data security - Basic elements of Fire Wall using IP Tables.	

Book(s) for Study	
1	Linux Administration: A Beginner's Guide, Wale Soyinka, McGraw-Hill,2015
2	UNIX and Linux System Administration Handbook, Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, Addison-Wesley Professional, 2017
Book(s) for reference	
1	Linux System Administration Adelste in Tom and Bill Lubanovic, O'ReillyMedia,Inc,USA,2007
Related Online Contents	
1	https://swayam.gov.in/nd2_aic20_sp26/preview
Course Designed by : Mr. T.Ramesh	


Job Oriented
Certificate
Course

JOB ORIENTED CERTIFICATE COURSE: MULTIMEDIA AND ANIMATION	
Name of the Department	Information Technology
Name of the Faculty Member i/c With Complete Address with Phone and e-mail	Dr. R. Vadivel Assistant Professor Department of Information Technology Bharathiar University Coimbatore – 641 046 Phone : 9994268885 e-mail : vlr_vadivel@yahoo.co.in
Inter / Intra Department Course	Inter Department Course
Duration of the Course	50 Hours
Eligibility	UG/PG in IT/CA/CS
Number of Candidates to be Admitted	30
Mode of the Course Regular	Regular
Collaboration if any with Companies (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.)	Yes., Yet to finalise the company
Registration Procedure	First Come First Served

Job Opportunities

Game Programmer , Game designer, Animator

Film Industry, Cartoon

The objectives of the Course are:

The main objectives of this course are to:

1	To learn the basics and Fundamentals of Multimedia, introduce Multimedia components and Tools
2	To provide a comprehensive introduction to different techniques related to art for animation
3	To apply animation in various application in creating animation projects
4	Learning and experiencing the art of storytelling, animation and cinematography while Making 2D/3D animation movies
5	To design motion graphics and GIF stickers

Course Content	Lecture / Practical / Project / Internship

Module 1	Definition of Multimedia, Classification of Multimedia, media Element, benefits of multimedia	5 Hours
Module 2	Image Enhancement, Image animation, Image Annotation, Spatial Character Recognition	5 Hours
Module 3	Hypermedia, Interactive Media, Multimedia vs hypermedia, Types of graphics File formats: GIF, JPG, PNG, PS, EPS, PDF, PSD, TIFF.	5 Hours
Module 4	Graphics definition, Raster Graphics , Advantages and disadvantages of Graphics and its Applications	5 Hours
Module 5	Audio file format: uncompressed audio format, Lossless compressed file format	5 Hours

Module 6	Lossy compressed audio format, MP3. Video File Format: MPEG, MPEG-2, MPEG-4.	5 Hours
Module 7	Definition, 2D animation, 3D animation, Real time Animation, Key Frame Animation , Character Animation, motion part animation, shape animation.	5 Hours
Module 8	Hierarchical animation, Procedural Animation, Simulation and Camera Animation, Traditional Animation, Stop Motion Animation , Computer Animations and Application of animations.	5 hours
Module 9	Difference between film and animation, drawn animation, cut off animation, Flash, Shockwave.	5 Hours
Module 10	Animation File Formats, Cartoon Vs animation.	5 Hours
	Total	50 Hours

Book(s) for Study	
1	Prabat K Andleigh and Kiran Thakrar, ―Multimedia Systems and Design, PHI, 2003
2	Donald Hearn and M.Pauline Baker, Computer Graphics C Version‖, Pearson Education, 2003.

Book(s) for reference	
1	Digital Multimedia by Nigel Chapman.
2	Multimedia Applications (X. media. publishing) by Ralf Steinmetz.

Related Online Contents
Related Online Contents 1 https://www.pdfdrive.com/animation
1. https://www.pdfdrive.com/animation books.html,
2 .https://nptel.ac.in/courses/106/102/106102065
3. https://nptel.ac.in/content/storage2/courses/117105083/pdf/ssg_m1l1.pdf
4 https://swayam.gov.in/nd2_ugc19_cs09/preview
5. https://swayam.gov.in/nd2_cec20_cs08/preview
6. https://www.classcentral.com/course/swayam - animations - 13880.

EMBEDDED SYSTEM & WIRELESS SENSOR NETWORK FOR IOT	
Name of the Department	Information Technology
Name of the Faculty Member i/c With Complete Address with Phone and e-mail	Mrs.W.Rose Varuna Assistant Professor Department of Information technology Bharathiar university Coimbatore-641046 Mobile no:9994950331 Email ID:hvaruna@gmail.com
Inter / Intra Department Course	Intra Department
Duration of the Course	45 Hours
Eligibility	M.Sc. (IT/CS/Data Analytics/Cyber Security), MCA
Number of Candidates to be Admitted	50
Mode of the Course	Regular
Collaboration if any with Companies (if Yes, Full Address of the Company Address , Name of the Contact Person, Phone, e-mail etc.)	Will decide later
Registration Procedure	Online registration and payment

Job Opportunities: IoT based Industrial Opportunities

The objectives of the Course are:

The main objectives of this course are to:

1	**Establishing basic concepts and key components of Internet of Things.**
2	**Hands-on training in handling IoT building blocks.**
3	**Understanding the interaction between cloud computation and sensors.**
4	**Troubleshooting the errors while implementing IoT for practical applications.**
5	**Establishing the usage of commercially available components.**

Course Content	Lecture / Practical / Project / Internship

Module 1	IoT Overview	4—hours
Module 2	Demo HTTP Web Server, Preparing Sensor Node	5—hours
Module 3	Creating Own Web Server	4—hours
Module 4	Experiment Thingspeak cloud server, Experiment Freeboard Cloud server	5—hours
Module 5	Experiment MQTT IBM CLOUD, Experiment MQTT Eclipse cloud mobile app	5—hours
Module 6	Experiment Sending Email	4—hours
Module 7	Experiment SMS Alert	4—hours
Module 8	Experiment Wireless Sensor Network, Project WSN	5—hours
Module 9	Experiment PubNub cloud server	4—hours
Module 10	Project Preparation	5—hours

Book(s) for Study	
1	Building Blocks for IoT Analytics Internet-of-Things Analytics by MONCEF GABBOUJ, THANOS STOURAITIS, 2017, River Publishers.
Book(s) for reference	
1	Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies by Dimitrios Serpanos, Marilyn Wolf, 2018, Springer.
Related Online Contents	
1	Introduction to internet of things By Prof. Sudip Misra, IIT Kharagpur

Annexure

BHARATHIAR UNIVERSITY, COIMBATORE – 641 046

DEPARTMENT OF INFORMATION TECHNOLOGY

MISSION

- **To mould the students as innovative and high quality IT professional to meet the global challenges.**
- **To provide value-based IT education to the students and enrich their knowledge.**
- **To engage the students in research and development to pursue higher education.**

BHARATHIAR UNIVERSITY, COIMBATORE – 641 046

M. Sc INFORMATION TECHNOLOGY (CBCS)
(Effective from the academic Year 2021 - 2022)

1. **Eligibility for Admission to the Programme**

Candidates for admission to the first year programme leading to the Degree of Master of Science in Information Technology (M.Sc. IT) will be required to possess:

A Pass with 50% of marks in B.Sc. Computer Science / B.C.A. /B.Sc. Computer Technology / B.Sc. Information Technology.

In case of SC/ST candidates, a mere pass in any of the above Bachelor's degree will be sufficient.

2. **Duration of the Programme**

The programme shall be offered on a full-time basis. The programme will consist of three semesters of course work and laboratory work and the fourth semester consists of project work.

3. **Regulations**

The general Regulations of the Bharathiar University Choice Based Credit System Programme are applicable to this programme.

4. **The Medium of Instruction and Examinations**

The medium of instruction and Examinations shall be in English.

5. **Submission of Record Notebooks for Practical Examinations & Project Viva-Voce.**

Students taking the Practical Examinations should submit bonafide Record Note Books prescribed for the Examinations. Otherwise the students will not be permitted to take the Practical Examinations.

Students taking the Project Viva Examination should submit Project Report prescribed for the Examinations. Otherwise the students will not be permitted to take the Project Viva-voce Examination.

6. Online Courses

Students have to complete one online course of minimum 3 months duration to complete the M.Sc.(IT) programme from Swayam/NPTEL/BU-MOOCs. This will carry 2 credits over and above the 90 credits.

7**. Job Oriented Course/ Value Added Course**

Students have to complete one Job Oriented course and one Value Added Course apart from their regular curriculum.

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